NIXON PEABODY LLP
ATTORNEYS AT LAW

100 Summer Street
Boston, Massachusetts 02110-2131
(617) 345-1000
Fax: (617) 345-1300

Robert L. Dewees, Jr.
Direct Dial: (617) 345-1316
Direct Fax: (866) 947-1870
E-Mail: rdewees@nixonpeabody.com

June 7, 2005

By Courier and E-File

Mary L. Cottrell, Secretary
Department of Telecommunications and Energy
One South Station, 2nd floor
Boston, MA 02202

Re: Bay State Gas Company, D.T.E. 05-27

Dear Ms. Cottrell:

Enclosed for filing, on behalf of Bay State Gas Company ("Bay State"), please find Bay State's responses to the following information requests of the Department of Telecommunications and Energy:

DTE-2-1	DTE-2-2	DTE-2-3	DTE-2-4
DTE-2-5	DTE-2-6	DTE-2-7	DTE-2-8

The spreadsheet referred to in the response to DTE-2-7(b) and the data referred to in the response to DTE-2-8(b) are contained in the enclosed compact disk being filed with the Hearing Officer. Please do not hesitate to contact me with any questions.

Very truly yours,

Robert L. Dewees, Jr.

RLD/tlm
Enclosures

cc: Caroline O'Brien Bulger, Esq., Hearing Officer (1 copy)
John Sullivan, DTE (7 copies)
Andreas Thanos, Assistant Director, Gas Division
Alexander Cochis, Assistant Attorney General (4 copies)

BOS1498835.1

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-1 Refer to Exh. BSG/JLH-3. Please discuss whether the method of estimating the marginal distribution capacity cost complies with the Department's directives set in Fitchburg Gas and Electric Light Company, D.T.E. 02-24/25 (2002) and Boston Gas Company, D.T.E. 03-40 (2003). Specifically, please answer the following questions:

a) Are the time series data used no less than 30 years in length?
b) Has the Company used multiple variable regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
c) Are the appropriate tests and remedial procedures for multicollinearity, heteroskedasticity, and autocorrelation performed and presented? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
d) Has the Company tested and presented alternative functional forms (e.g., linear, logarithmic, parabolic, or other) of regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
e) Has the Company determined the shape and location of the marginal cost curve to provide and assessment of whether the distribution costs exhibit increasing, constant, or decreasing returns to scale? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation.

Response: Long-run marginal costs are defined as the change in cost for a small change in output over the long run. Many methods to measure marginal costs have been advocated by marginal cost practitioners. Most agree that marginal costs are forward looking and that historical costs are sunk and have no bearing on forward-looking marginal cost estimates. As an example, the Department has routinely approved marginal cost studies that employ the peaker method or the modified peaker method to estimate production capacity-related plant investment. Many marginal cost analysts, including me, believe that the historical data can be extremely useful in estimating marginal costs, when past cost causation remains indicative of the future. While an econometric analysis of historical peaking plant investment could be performed, the forward-looking peaker method is the Department's de facto standard for measuring marginal production capacity-related investment.

Most current marginal costing techniques borrow heavily from the methods originally proposed by NERA in its landmark publication, "Topic 4, How to Quantify Marginal Costs," published as part of the Electric Utility Rate Design Study, a nationwide effort by the Electric Power Research Institute, the Edison Electric Institute, the American Public Power Association, and the National Rural Electric Cooperative Association for the National Association of Regulatory Utility Commissioners on March 10, 1977. In that report, the peaker method was advocated for measuring production capacity-related investment. Operating and maintenance expenses were estimated using the single most recent year of historical data. Subsequently, various regulators have approved marginal cost studies that relied on more than one year of accounting data to estimate marginal O&M expenses. Soon after the NERA study was published, instead of using a single year of data, I began using an average of five years of data. As I refined my methods, I transitioned to using 10 to 15 years of data, and then rudimentary regression techniques to replace simple averages of historical data. Recently, the Department has issued directives to ensure more rigorous econometric analyses. However, I believe that the Department did not intend that only econometric analyses should be employed to quantify marginal costs. The fact that the Department accepted the modified peaker method in the Fitchburg case, the same case where it issued its initial econometric analysis directives, supports this interpretation.

In this filing, I have employed a number of methods to quantify marginal costs including the modified peaker method, engineering studies, short-term (two-year) averages, and in one case, a long-term average (21 years). In my opinion, I have complied with the Department's econometric directives whenever possible, but not when sufficient historical data was unavailable or when the interview process revealed that historical trends were not indicative of the future. In the latter case, my spreadsheet models were designed to perform an initial econometric analysis, and I have presented some of that analysis as a matter of convenience. However, as I point out in responses to several information requests in DTE Set 2, based on my professional judgment I determined not to the expend the additional cost or time to develop fully econometric models that I was able to determine in advance would not be used.

The Company's estimate of marginal distribution capacity cost was based on two separate estimates, including: (1) the forward-looking engineering estimates of the cost to reinforce the distribution system to accommodate growth and (2) the historically developed estimate of costs for main extensions to connect new load. The forward-looking estimate relied on ten years of projected data and was not based on econometric analyses. I believe the Department's orders in the Fitchburg and Boston Gas rate cases referred to in this request were directed at the situations where econometric analyses are used to assist in the determination of marginal costs. Therefore, the estimates of reinforcement costs do not fall under the directives of these orders. The remainder of this response will address the computation of main reinforcement costs, which were based

on historical data but not subject to the Department's directives for econometric analyses.

a) As shown on Schedule JLH-3-2, page 4 of 5, 29 years of data were originally reviewed, but only 21 years of data was deemed valid. The data used in this analysis consists of annual estimates of capital investments for main extensions. These investments are a subset of the costs booked in Account 367, Gas Mains. Neither the Uniform System of Accounts nor Bay State Gas Company's accounting procedures segregate gas main investments into those required for reinforcement, those required for replacement and those required for main extension. Consequently, the data shown on the schedule is not useful, and the only source of relevant data was the Company's distribution planning personnel. The Company's first marginal cost study, performed for its 1988 rate case, did not require information in the same form and substance as is currently required. When the Company performed its second marginal cost study, for its 1992 rate case, the Company's engineers estimated main extension costs back to 1984 (21 years ago). In assembling data for the current marginal cost study, it was impossible to develop meaningful estimates of cost data prior to 1984. Consequently, the study relied on 21 years of data. Rather than using econometric techniques on a database with less than 30 years of data, the 21 years of data was adjusted for price escalation and then a simple incremental unit cost calculation was performed.

b) No. The Company's analysis was based solely on design day demand for firm customers at the system level. Design day demand, customer count and system sendout variables are highly correlated as shown on Attachment DTE-2-8. While either of these variables could be considered as the causative variable, the Company's analysis relies on Department precedent whereby mains investment has been considered demand-related. I considered using two demand-related variables, residential design day demand and general service design day demand. However, this data was only available in years when rate cases were filed. Therefore, the Company is not aware of a demand variable with sufficient data available other than firm design day demand.

c) No. These tests are not applicable to the analyses conducted.

d) No. These tests are not applicable to the analyses conducted.

e) While not ultimately used to estimate marginal costs, the Company performed an econometric analysis of total distribution capacity-related costs. This information was summarized on Schedule JLH-3-2, page 5 of 5 (as corrected). Only one case is presented in my testimony, a linear regression of cumulative plant investments against annual design day sendout for firm load. This analysis is shown in Volume III of the filing, page 406 of my workpapers. The linear

regression indicated a high correlation but also indicated the presence of first order serial correlation. On pages 407 and 408 of the workpapers, the variables were transformed using the Cochrane Orcott procedure. The transformed variables indicate the continued presence of serial correlation at the 5% level but not at the 1% continued confidence level.

A multi-variate regression analysis was also performed, as shown on pages 409 to 414 of the workpapers in Volume III. Using design day demand and customer count for firm customers, a second regression analysis was performed showing a high correlation in the presence of first order serial correlation which was successfully removed using the Cochrane Orcott procedure.

The Company also conducted these same two regression analyses using the natural logarithm of the independent variables. These workpapers were not include in the original filing but are included as Attachment 1 to DTE-2-1. Using the logarithmic transformation, the R-Squared and Durbin-Watson statistics were both improved. Correcting for serial correlation, two valid prediction equations were developed, the first using the natural log of design day demand and the second adding a second independent variable, the natural log of firm customer count. The positive coefficients of the independent variables indicate that the distribution capacity-related investment curve is upward sloping. In addition, the slope of the curve decreases slightly as the independent variable increases indicating that the increase in marginal costs is lessening as demands increase.

In order to develop a better understanding of the shape and location of the long-run marginal cost curve, marginal and accounting costs from the current case were compared with those presented in Bay State Gas Company D.P.U. 95-52. Attachment 2 to DTE-2-1 presents the results of this analysis. Average and marginal costs to serve the Residential Heating class were first adjusted for price escalation (to make the results comparable). The data suggests that the marginal cost per customer is increasing slightly. However, marginal costs were below average costs in the previous case. As a result, growth has lowered the average costs to serve on a per-customer basis. In the same period, marginal costs increased to where they are now slightly above the average costs to serve. Over time, the shape and location of the marginal cost curve can change, so analyses from two different periods are not directly comparable. Furthermore, the margin of error in measuring marginal costs is unknown. With these qualifications, I conclude that the marginal cost curve is very close to the average cost curve at the present time. This result is to be expected since the Company's line extension policy ensures that costs for serving incremental load are similar to current average costs. If not, a customer contribution is required to make it so.

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 1C Distribution Capacity-Related Investme

R SQUARED, ADJUSTED =		0.97	
DURBIN WATSON STATISTIC =		1.03	
		Before Cochrane Orcott Adjustment	
		X-VARIABLE COEFF.	t STATISTIC
DPI =	Distribution Plant Capacity-related Investment		
CONSTANT		-2.24E+09	-30.484
DDD =	Design Day Demand	1.82E+08	31.550
CUST =	Customer Count		

Line Estimate Results

1.82E+08	-2.24E+09	#N/A	#N/A
5.77E+06	7.36E+07	#N/A	#N/A
0.973591	8,588,508	#N/A	#N/A
995.3725	27	#N/A	#N/A
7.34E+16	1.99E+15	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPI DISTR PLANT INVEST	DDD DESIGN DAY DEMAND	CUST CUST'S	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	-	12.33		-612280	612280	0
1977	4,271,252	12.31		-4095443	8366695	4271252
1978	8,709,537	12.35		3971764	4737773	8709537
1979	14,171,669	12.45		21558364	-7386695	14171669
1980	17,555,811	12.43		18304647	-748836	17555811
1981	20,482,450	12.49		28184380	-7701930	20482450
1982	25,131,748	12.55		40146509	-15014760	25131748
1983	26,864,548	12.47		25415890	1448657	26864548
1984	30,623,182	12.49		29120256	1502926	30623182
1985	37,471,980	12.51		32665642	4806338	37471980
1986	45,457,524	12.59		46109879	-652355	45457524
1987	56,022,555	12.64		55340767	681787	56022555
1988	64,157,785	12.67		60936428	3221357	64157785
1989	70,317,222	12.74		73810480	-3493258	70317222
1990	77,529,058	12.81		87295683	-9766625	77529058
1991	85,179,871	12.84		92822466	-7642595	85179871
1992	90,741,028	12.87		97186260	-6445232	90741028
1993	109,280,404	12.91		105750666	3529738	109280404
1994	115,788,625	12.95		112693885	3094740	115788625
1995	120,821,863	12.99		118892277	1929586	120821863
1996	124,794,681	13.02		125851865	-1057185	124794681
1997	127,968,212	13.06		132256013	-4287801	127968212
1998	131,965,544	13.08		135268765	-3303221	131965544
1999	135,453,840	12.98		118331797	17122044	135453840
2000	138,343,843	13.01		122760698	15583144	138343843
2001	141,063,792	13.03		126976646	14087146	141063792
2002	143,813,174	13.05		130651722	13161452	143813174
2003	145,956,482	13.21		159731370	-13774888	145956482
2004	149,025,071	13.22		161635356	-12610284	149025071

REGRESSION MODEL NO. 1C Distribution Capacity-Related Investment vs Ln (Desn day demand) WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.93
DURBIN WATSON STATISTIC = 1.54
After Cochrane Orcott Adjustment

X-VARIABLE COEFF.	t STATISTIC
-1.18E+09	-17.672
1.73E+08	18.382

Line Estimate Results

1.73E+08	(1,178,773,119)	#N/A	#N/A
9.40E+06	66,702,632	#N/A	#N/A
0.928551	7,613,264	#N/A	#N/A
337.8966	26	#N/A	#N/A
1.96E+16	1.51E+15	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

		TRANSFORMED VARIABLES									ORIGINAL			RHO	0.44603		
YEAR	Y INVEST	X1 DEMAND	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ESTIMATED + RESIDUAL (Y)	DIFFERENCE	ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976													6.12E+05			
1977	4,271,252	6.81	-	-	(1,470,088)	5,741,339	-1.47E+06	-4.10E+06	2.63E+06	-1.47E+06	4.27E+06	-5.74E+06	8.37E+06	6.12E+05	7.00E+13	5.12E+12
1978	6,804,443	6.86	-	-	7,666,012	(861,568)	9.57E+06	3.97E+06	5.60E+06	9.57E+06	8.71E+06	8.62E+05	4.74E+06	8.37E+06	2.24E+13	3.96E+13
1979	10,286,981	6.94	-	-	20,949,689	(10,662,708)	2.48E+07	2.16E+07	3.28E+06	2.48E+07	1.42E+07	1.07E+07	-7.39E+06	4.74E+06	5.46E+13	-3.50E+13
1980	11,234,864	6.88	-	-	10,410,978	823,887	1.67E+07	1.83E+07	-1.57E+06	1.67E+07	1.76E+07	-8.24E+05	-7.49E+05	-7.39E+06	5.61E+11	5.53E+12
1981	12,652,084	6.94	-	-	21,171,105	(8,519,021)	2.90E+07	2.82E+07	8.17E+05	2.90E+07	2.05E+07	8.52E+06	-7.70E+06	-7.49E+05	5.93E+13	5.77E+12
1982	15,996,023	6.98	-	-	28,345,963	(12,349,940)	3.75E+07	4.01E+07	-2.66E+06	3.75E+07	2.51E+07	1.23E+07	-1.50E+07	-7.70E+06	2.25E+14	1.16E+14
1983	15,655,110	6.87	-	-	9,290,833	6,364,277	2.05E+07	2.54E+07	-4.92E+06	2.05E+07	2.69E+07	-6.36E+06	1.45E+06	-1.50E+07	2.10E+12	-2.18E+13
1984	18,640,868	6.93	-	-	19,047,820	(406,952)	3.10E+07	2.91E+07	1.91E+06	3.10E+07	3.06E+07	4.07E+05	1.50E+06	1.45E+06	2.26E+12	2.18E+12
1985	23,813,214	6.94	-	-	20,845,583	2,967,631	3.45E+07	3.27E+07	1.84E+06	3.45E+07	3.75E+07	-2.97E+06	4.81E+06	1.50E+06	2.31E+13	7.22E+12
1986	28,744,010	7.01	-	-	32,110,834	(3,366,824)	4.88E+07	4.61E+07	2.71E+06	4.88E+07	4.55E+07	3.37E+06	-6.52E+05	4.81E+06	4.26E+11	-3.14E+12
1987	35,747,272	7.02	-	-	35,182,282	564,990	5.55E+07	5.53E+07	1.17E+05	5.55E+07	5.60E+07	-5.65E+05	6.82E+05	-6.52E+05	4.65E+11	-4.45E+11
1988	39,170,214	7.03	-	-	36,586,235	2,583,979	6.16E+07	6.09E+07	6.37E+05	6.16E+07	6.42E+07	-2.58E+06	3.22E+06	6.82E+05	1.04E+13	2.20E+12
1989	41,701,118	7.09	-	-	46,441,618	(4,740,500)	7.51E+07	7.38E+07	1.25E+06	7.51E+07	7.03E+07	4.74E+06	-3.49E+06	3.22E+06	1.22E+13	-1.13E+13
1990	46,165,679	7.13	-	-	53,794,556	(7,628,877)	8.52E+07	8.73E+07	-2.14E+06	8.52E+07	7.75E+07	7.63E+06	-9.77E+06	-3.49E+06	9.54E+13	3.41E+13
1991	50,599,819	7.13	-	-	53,331,159	(2,731,340)	8.79E+07	9.28E+07	-4.91E+06	8.79E+07	8.52E+07	2.73E+06	-7.64E+06	-9.77E+06	5.84E+13	7.46E+13
1992	52,748,507	7.14	-	-	55,134,203	(2,385,696)	9.31E+07	9.72E+07	-4.06E+06	9.31E+07	9.07E+07	2.39E+06	-6.45E+06	-7.64E+06	4.15E+13	4.93E+13
1993	68,807,456	7.17	-	-	61,418,824	7,388,632	1.02E+08	1.06E+08	-3.86E+06	1.02E+08	1.09E+08	-7.39E+06	3.53E+06	-6.45E+06	1.25E+13	-2.27E+13
1994	67,046,616	7.19	-	-	64,384,739	2,661,877	1.13E+08	1.13E+08	4.33E+05	1.13E+08	1.16E+08	-2.66E+06	3.09E+06	3.53E+06	9.58E+12	1.09E+13
1995	69,177,011	7.21	-	-	67,330,014	1,846,998	1.19E+08	1.19E+08	8.26E+04	1.19E+08	1.21E+08	-1.85E+06	1.93E+06	3.09E+06	3.72E+12	5.97E+12
1996	70,904,869	7.23	-	-	71,313,612	(408,743)	1.25E+08	1.26E+08	-6.48E+05	1.25E+08	1.25E+08	4.09E+05	-1.06E+06	1.93E+06	1.12E+12	-2.04E+12
1997	72,306,416	7.25	-	-	74,447,343	(2,140,927)	1.30E+08	1.32E+08	-2.15E+06	1.30E+08	1.28E+08	2.14E+06	-4.29E+06	-1.06E+06	1.84E+13	4.53E+12
1998	74,888,268	7.25	-	-	74,595,797	292,471	1.32E+08	1.35E+08	-3.60E+06	1.32E+08	1.32E+08	-2.92E+05	-3.30E+06	-4.29E+06	1.09E+13	1.42E+13
1999	76,593,646	7.15	-	-	57,236,037	19,357,609	1.16E+08	1.18E+08	-2.24E+06	1.16E+08	1.35E+08	-1.94E+07	1.71E+07	-3.30E+06	2.93E+14	-5.66E+13
2000	77,927,774	7.22	-	-	68,615,572	9,312,202	1.29E+08	1.23E+08	6.27E+06	1.29E+08	1.38E+08	-9.31E+06	1.56E+07	1.71E+07	2.43E+14	2.67E+14
2001	79,358,704	7.23	-	-	70,743,232	8,615,472	1.32E+08	1.27E+08	5.47E+06	1.32E+08	1.41E+08	-8.62E+06	1.41E+07	1.56E+07	1.98E+14	2.20E+14
2002	80,894,916	7.24	-	-	72,447,468	8,447,448	1.35E+08	1.31E+08	4.71E+06	1.35E+08	1.44E+08	-8.45E+06	1.32E+07	1.41E+07	1.73E+14	1.85E+14
2003	81,811,925	7.39	-	-	98,505,492	(16,693,567)	1.63E+08	1.60E+08	2.92E+06	1.63E+08	1.46E+08	1.67E+07	-1.38E+07	1.32E+07	1.90E+14	-1.81E+14
2004	83,924,541	7.33	-	-	87,996,687	(4,072,146)	1.53E+08	1.62E+08	-8.54E+06	1.53E+08	1.49E+08	4.07E+06	-1.26E+07	-1.38E+07	1.59E+14	1.74E+14
												SUM	-6.12E+05	1.26E+07	1.99E+15	8.88E+14

ORIGINAL REGRESSION D-W
SLOPE 0.486296849

INTERCEPT -240879.3493

DURBIN-WATSON 1.03
R-SQUARED 0.974

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
612,280				3.75E+11	
8.37E+06	6.12E+05	7.75E+06	6.01E+13	7.00E+13	5.12E+12
4.74E+06	8.37E+06	-3.63E+06	1.32E+13	2.24E+13	3.96E+13
-7.39E+06	4.74E+06	-1.21E+07	1.47E+14	5.46E+13	-3.50E+13
-7.49E+05	-7.39E+06	6.64E+06	4.41E+13	5.61E+11	5.53E+12
-7.70E+06	-7.49E+05	-6.95E+06	4.83E+13	5.93E+13	5.77E+12
-1.50E+07	-7.70E+06	-7.31E+06	5.35E+13	2.25E+14	1.16E+14
1.45E+06	-1.50E+07	1.65E+07	2.71E+14	2.10E+12	-2.18E+13
1.50E+06	1.45E+06	5.43E+04	2.95E+09	2.26E+12	2.18E+12
4.81E+06	1.50E+06	3.30E+06	1.09E+13	2.31E+13	7.22E+12
-6.52E+05	4.81E+06	-5.46E+06	2.98E+13	4.26E+11	-3.14E+12
6.82E+05	-6.52E+05	1.33E+06	1.78E+12	4.65E+11	-4.45E+11
3.22E+06	6.82E+05	2.54E+06	6.45E+12	1.04E+13	2.20E+12
-3.49E+06	3.22E+06	-6.71E+06	4.51E+13	1.22E+13	-1.13E+13
-9.77E+06	-3.49E+06	-6.27E+06	3.94E+13	9.54E+13	3.41E+13
-7.64E+06	-9.77E+06	2.12E+06	4.51E+12	5.84E+13	7.46E+13
-6.45E+06	-7.64E+06	1.20E+06	1.43E+12	4.15E+13	4.93E+13
3.53E+06	-6.45E+06	9.97E+06	9.95E+13	1.25E+13	-2.27E+13
3.09E+06	3.53E+06	-4.35E+05	1.89E+11	9.58E+12	1.09E+13
1.93E+06	3.09E+06	-1.17E+06	1.36E+12	3.72E+12	5.97E+12
-1.06E+06	1.93E+06	-2.99E+06	8.92E+12	1.12E+12	-2.04E+12
-4.29E+06	-1.06E+06	-3.23E+06	1.04E+13	1.84E+13	4.53E+12
-3.30E+06	-4.29E+06	9.85E+05	9.69E+11	1.09E+13	1.42E+13
1.71E+07	-3.30E+06	2.04E+07	4.17E+14	2.93E+14	-5.66E+13
1.56E+07	1.71E+07	-1.54E+06	2.37E+12	2.43E+14	2.67E+14
1.41E+07	1.56E+07	-1.50E+06	2.24E+12	1.98E+14	2.20E+14
1.32E+07	1.41E+07	-9.26E+05	8.57E+11	1.73E+14	1.85E+14
-1.38E+07	1.32E+07	-2.69E+07	7.26E+14	1.90E+14	-1.81E+14
-1.26E+07	-1.38E+07	1.16E+06	1.36E+12	1.59E+14	1.74E+14
-6.12E+05	1.26E+07	-1.32E+07	2.05E+15	1.99E+15	8.88E+14

TRANSFORMED REGRESSION D-W
SLOPE 0.218345588

INTERCEPT -245573.1341

DURBIN-WATSON 1.54
R-SQUARED

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
5.74E+06				3.30E+13	
-8.62E+05	5.74E+06	-6.60E+06	4.36E+13	7.42E+11	-4.95E+12
-1.07E+07	-8.62E+05	-9.80E+06	9.61E+13	1.14E+14	9.19E+12
8.24E+05	-1.07E+07	1.15E+07	1.32E+14	6.79E+11	-8.78E+12
-8.52E+06	8.24E+05	-9.34E+06	8.73E+13	7.26E+13	-7.02E+12
-1.23E+07	-8.52E+06	-3.83E+06	1.47E+13	1.53E+14	1.05E+14
6.36E+06	-1.23E+07	1.87E+07	3.50E+14	4.05E+13	-7.86E+13
-4.07E+05	6.36E+06	-6.77E+06	4.58E+13	1.66E+11	-2.59E+12
2.97E+06	-4.07E+05	3.37E+06	1.14E+13	8.81E+12	-1.21E+12
-3.37E+06	2.97E+06	-6.33E+06	4.01E+13	1.13E+13	-9.99E+12
5.65E+05	-3.37E+06	3.93E+06	1.55E+13	3.19E+11	-1.90E+12
2.58E+06	5.65E+05	2.02E+06	4.08E+12	6.68E+12	1.46E+12
-4.74E+06	2.58E+06	-7.32E+06	5.36E+13	2.25E+13	-1.22E+13
-7.63E+06	-4.74E+06	-2.89E+06	8.34E+12	5.82E+13	3.62E+13
-2.73E+06	-7.63E+06	4.90E+06	2.40E+13	7.46E+12	2.08E+13
-2.39E+06	-2.73E+06	3.46E+05	1.19E+11	5.69E+12	6.52E+12
7.39E+06	-2.39E+06	9.77E+06	9.55E+13	5.46E+13	-1.76E+13
2.66E+06	7.39E+06	-4.73E+06	2.23E+13	7.09E+12	1.97E+13
1.85E+06	2.66E+06	-8.15E+05	6.64E+11	3.41E+12	4.92E+12
-4.09E+05	1.85E+06	-2.26E+06	5.09E+12	1.67E+11	-7.55E+11
-2.14E+06	-4.09E+05	-1.73E+06	3.00E+12	4.58E+12	8.75E+11
2.92E+05	-2.14E+06	2.43E+06	5.92E+12	8.55E+10	-6.26E+11
1.94E+07	2.92E+05	1.91E+07	3.63E+14	3.75E+14	5.66E+12
9.31E+06	1.94E+07	-1.00E+07	1.01E+14	8.67E+13	1.80E+14
8.62E+06	9.31E+06	-6.97E+05	4.85E+11	7.42E+13	8.02E+13
8.45E+06	8.62E+06	-1.68E+05	2.82E+10	7.14E+13	7.28E+13
-1.67E+07	8.45E+06	-2.51E+07	6.32E+14	2.79E+14	-1.41E+14
-4.07E+06	-1.67E+07	1.26E+07	1.59E+14	1.66E+13	6.80E+13
2.78E-06	4.07E+06	-9.81E+06	2.32E+15	1.51E+15	3.24E+14

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 1D Multi-variate Distribution Capacity-Rela

R SQUARED, ADJUSTED =		0.99	
DURBIN WATSON STATISTIC =		1.00	
		Before Cochrane Orcott Adjustment	
		X-VARIABLE COEFF.	t STATISTIC
DPI =	Distribution Plant Capacity-related Investment		
CONSTANT		-3.41E+09	-15.063
DDD =	Design Day Demand	7.10E+07	3.317
CUST =	Customer Count	2.09E+08	5.2887

Line Estimate Results

2.09E+08	7.10E+07	-3.41E+09	#N/A
3.96E+07	2.14E+07	2.26E+08	#N/A
0.987278	6,074,632	#N/A	#N/A
1,008.8205	26	#N/A	#N/A
7.45E+16	9.59E+14	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPI DISTR PLANT INVEST	DDD DESIGN DAY DEMAND	CUST CUST'S	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	-	12.33	12.13	2440859	-2440859	0
1977	4,271,252	12.31	12.12	563626	3707625	4271252
1978	8,709,537	12.35	12.13	4740344	3969193	8709537
1979	14,171,669	12.45	12.15	15911177	-1739508	14171669
1980	17,555,811	12.43	12.17	18511916	-956104	17555811
1981	20,482,450	12.49	12.18	24443333	-3960884	20482450
1982	25,131,748	12.55	12.18	29892707	-4760958	25131748
1983	26,864,548	12.47	12.20	26875234	-10686	26864548
1984	30,623,182	12.49	12.18	25594045	5029137	30623182
1985	37,471,980	12.51	12.22	34707582	2764398	37471980
1986	45,457,524	12.59	12.24	45267250	190274	45457524
1987	56,022,555	12.64	12.27	54639953	1382601	56022555
1988	64,157,785	12.67	12.30	62520453	1637332	64157785
1989	70,317,222	12.74	12.33	73805437	-3488215	70317222
1990	77,529,058	12.81	12.35	83021719	-5492661	77529058
1991	85,179,871	12.84	12.45	106534201	-21354330	85179871
1992	90,741,028	12.87	12.39	96353916	-5612888	90741028
1993	109,280,404	12.91	12.41	103405201	5875202	109280404
1994	115,788,625	12.95	12.42	108787730	7000895	115788625
1995	120,821,863	12.99	12.44	114651107	6170756	120821863
1996	124,794,681	13.02	12.46	121074600	3720080	124794681
1997	127,968,212	13.06	12.47	126643107	1325105	127968212
1998	131,965,544	13.08	12.49	131293865	671679	131965544
1999	135,453,840	12.98	12.51	129782566	5671274	135453840
2000	138,343,843	13.01	12.52	132829500	5514343	138343843
2001	141,063,792	13.03	12.53	136708701	4355091	141063792
2002	143,813,174	13.05	12.54	140207468	3605706	143813174
2003	145,956,482	13.21	12.55	152837067	-6880585	145956482
2004	149,025,071	13.22	12.55	154918084	-5893012	149025071

REGRESSION MODEL NO. 1D Multi-variate Distribution Capacity-Related Investment (logarithmic) WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.96
DURBIN WATSON STATISTIC = 1.49

After Cochrane Orcott Adjustment

X-VARIABLE COEFF.	t STATISTIC
-1.67E+09	-14.009
7.53E+07	3.896
1.90E+08	5.305

Line Estimate Results

1.90E+08	75,269,049	-1.67E+09	#N/A
3.59E+07	19,320,947	1.19E+08	#N/A
0.961776	5,290,513	#N/A	#N/A
314.5189	25	#N/A	#N/A
1.76E+16	7.00E+14	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

		TRANSFORMED VARIABLES												RHO	0.48380		
YEAR	Y INVEST	X1 DEMAND	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE		ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976														-2.44E+06			
1977	4,271,252	6.35	6.26	-	594,946	3,676,305	594,946	563,626	31,320	594,946.4	4,271,251.6	(3,676,305.2)		3.71E+06	-2.44E+06	1.37E+13	-9.05E+12
1978	6,643,094	6.40	6.26	-	5,793,859	849,235	7,860,302	4,740,344	3,119,957	7,860,301.5	8,709,536.6	(849,235.1)		3.97E+06	3.71E+06	1.58E+13	1.47E+13
1979	9,957,973	6.47	6.28	-	14,920,604	(4,962,631)	19,134,300	15,911,177	3,223,123	19,134,300.3	14,171,669.0	4,962,631.3		-1.74E+06	3.97E+06	3.03E+12	-6.90E+12
1980	10,699,522	6.41	6.29	-	11,676,584	(977,062)	18,532,873	18,511,916	20,957	18,532,872.8	17,555,811.1	977,061.7		-9.56E+05	-1.74E+06	9.14E+11	1.66E+12
1981	11,988,904	6.47	6.29	-	16,601,778	(4,612,874)	25,095,324	24,443,333	651,990	25,095,323.5	20,482,449.8	4,612,873.7		-3.96E+06	-9.56E+05	1.57E+13	3.79E+12
1982	15,222,288	6.51	6.29	-	19,371,440	(4,149,153)	29,280,901	29,892,707	(611,806)	29,280,901.2	25,131,748.5	4,149,152.8		-4.76E+06	-3.96E+06	2.27E+13	1.89E+13
1983	14,705,744	6.40	6.30	-	13,018,924	1,686,821	25,177,727	26,875,234	(1,697,507)	25,177,726.9	26,864,547.8	(1,686,820.9)		-1.07E+04	-4.76E+06	1.14E+08	5.09E+10
1984	17,626,046	6.46	6.28	-	13,821,607	3,804,439	26,818,743	25,594,045	1,224,698	26,818,743	30,623,182	(3,804,439)		5.03E+06	-1.07E+04	2.53E+13	-5.37E+10
1985	22,656,407	6.47	6.33	-	22,773,302	(116,895)	37,588,875	34,707,582	2,881,293	37,588,875	37,471,980	116,895		2.76E+06	5.03E+06	7.64E+12	1.39E+13
1986	27,328,485	6.53	6.33	-	29,057,724	(1,729,239)	47,186,763	45,267,250	1,919,513	47,186,763	45,457,524	1,729,239		1.90E+05	2.76E+06	3.62E+10	5.26E+11
1987	34,030,090	6.55	6.35	-	33,094,975	935,115	55,087,440	54,639,953	447,486	55,087,440	56,022,555	(935,115)		1.38E+06	1.90E+05	1.91E+12	2.63E+11
1988	37,053,932	6.55	6.36	-	36,203,380	850,552	63,307,233	62,520,453	786,780	63,307,233	64,157,785	(850,552)		1.64E+06	1.38E+06	2.68E+12	2.26E+12
1989	39,277,523	6.61	6.38	-	43,597,089	(4,319,565)	74,636,787	73,805,437	831,351	74,636,787	70,317,222	4,319,565		-3.49E+06	1.64E+06	1.22E+13	-5.71E+12
1990	43,509,408	6.65	6.38	-	47,440,948	(3,931,540)	81,460,598	83,021,719	(1,561,121)	81,460,598	77,529,058	3,931,540		-5.49E+06	-3.49E+06	3.02E+13	1.92E+13
1991	47,671,117	6.64	6.48	-	64,702,545	(17,031,428)	102,211,299	106,534,201	(4,322,902)	102,211,299	85,179,871	17,031,428		-2.14E+07	-5.49E+06	4.56E+14	1.17E+14
1992	49,530,791	6.65	6.37	-	45,207,405	4,323,386	86,417,641	96,353,916	(9,936,274)	86,417,641	90,741,028	(4,323,386)		-5.61E+06	-2.14E+07	3.15E+13	1.20E+14
1993	65,379,665	6.69	6.42	-	56,476,056	8,903,610	100,376,794	103,405,201	(3,028,407)	100,376,794	109,280,404	(8,903,610)		5.88E+06	-5.61E+06	3.45E+13	-3.30E+13
1994	62,918,490	6.70	6.42	-	58,433,371	4,485,119	111,303,506	108,787,730	2,515,777	111,303,506	115,788,625	(4,485,119)		7.00E+06	5.88E+06	4.90E+13	4.11E+13
1995	64,803,034	6.72	6.43	-	61,564,048	3,238,986	117,582,878	114,651,107	2,931,770	117,582,878	120,821,863	(3,238,986)		6.17E+06	7.00E+06	3.81E+13	4.32E+13
1996	66,340,758	6.74	6.44	-	65,058,717	1,282,041	123,512,640	121,074,600	2,438,040	123,512,640	124,794,681	(1,282,041)		3.72E+06	6.17E+06	1.38E+13	2.30E+13
1997	67,592,230	6.76	6.45	-	67,475,226	117,004	127,851,208	126,643,107	1,208,101	127,851,208	127,968,212	(117,004)		1.33E+06	3.72E+06	1.76E+12	4.93E+12
1998	70,054,200	6.76	6.46	-	69,248,891	805,309	131,160,235	131,293,865	(133,630)	131,160,235	131,965,544	(805,309)		6.72E+05	1.33E+06	4.51E+11	8.90E+11
1999	71,608,577	6.66	6.47	-	64,742,300	6,866,277	128,587,563	129,782,566	(1,195,003)	128,587,563	135,453,840	(6,866,277)		5.67E+06	6.72E+05	3.22E+13	3.81E+12
2000	72,810,933	6.73	6.47	-	68,922,950	3,887,983	134,455,860	132,829,500	1,626,360	134,455,860	138,343,843	(3,887,983)		5.51E+06	5.67E+06	3.04E+13	3.13E+13
2001	74,132,691	6.74	6.47	-	71,231,833	2,900,858	138,162,934	136,708,701	1,454,232	138,162,934	141,063,792	(2,900,858)		4.36E+06	5.51E+06	1.90E+13	2.40E+13
2002	75,566,155	6.75	6.48	-	72,802,974	2,763,182	141,049,992	140,207,468	842,524	141,049,992	143,813,174	(2,763,182)		3.61E+06	4.36E+06	1.30E+13	1.57E+13
2003	76,379,305	6.90	6.48	-	84,358,965	(7,979,660)	153,936,142	152,837,067	1,099,075	153,936,142	145,956,482	7,979,660		-6.88E+06	3.61E+06	4.73E+13	-2.48E+13
2004	78,410,957	6.83	6.48	-	79,977,132	(1,566,175)	150,591,247	154,918,084	(4,326,837)	150,591,247	149,025,071	1,566,175		-5.89E+06	-6.88E+06	3.47E+13	4.05E+13
													SUM	2.44E+06	5.89E+06	9.53E+14	4.61E+14

ORIGINAL REGRESSION D-W

SLOPE	0.498968534
INTERCEPT	-17841.73996
DURBIN-WATSON	1.00
R-SQUARED	0.987

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
-2.44E+06				5.96E+12	
3.71E+06	-2.44E+06	6.15E+06	3.78E+13	1.37E+13	-9.05E+12
3.97E+06	3.71E+06	2.62E+05	6.84E+10	1.58E+13	1.47E+13
-1.74E+06	3.97E+06	-5.71E+06	3.26E+13	3.03E+12	-6.90E+12
-9.56E+05	-1.74E+06	7.83E+05	6.14E+11	9.14E+11	1.66E+12
-3.96E+06	-9.56E+05	-3.00E+06	9.03E+12	1.57E+13	3.79E+12
-4.76E+06	-3.96E+06	-8.00E+05	6.40E+11	2.27E+13	1.89E+13
-1.07E+04	-4.76E+06	4.75E+06	2.26E+13	1.14E+08	5.09E+10
5.03E+06	-1.07E+04	5.04E+06	2.54E+13	2.53E+13	-5.37E+10
2.76E+06	5.03E+06	-2.26E+06	5.13E+12	7.64E+12	1.39E+13
1.90E+05	2.76E+06	-2.57E+06	6.63E+12	3.62E+10	5.26E+11
1.38E+06	1.90E+05	1.19E+06	1.42E+12	1.91E+12	2.63E+11
1.64E+06	1.38E+06	2.55E+05	6.49E+10	2.68E+12	2.26E+12
-3.49E+06	1.64E+06	-5.13E+06	2.63E+13	1.22E+13	-5.71E+12
-5.49E+06	-3.49E+06	-2.00E+06	4.02E+12	3.02E+13	1.92E+13
-2.14E+07	-5.49E+06	-1.59E+07	2.52E+14	4.56E+14	1.17E+14
-5.61E+06	-2.14E+07	1.57E+07	2.48E+14	3.15E+13	1.20E+14
5.88E+06	-5.61E+06	1.15E+07	1.32E+14	3.45E+13	-3.30E+13
7.00E+06	5.88E+06	1.13E+06	1.27E+12	4.90E+13	4.11E+13
6.17E+06	7.00E+06	-8.30E+05	6.89E+11	3.81E+13	4.32E+13
3.72E+06	6.17E+06	-2.45E+06	6.01E+12	1.38E+13	2.30E+13
1.33E+06	3.72E+06	-2.39E+06	5.74E+12	1.76E+12	4.93E+12
6.72E+05	1.33E+06	-6.53E+05	4.27E+11	4.51E+11	8.90E+11
5.67E+06	6.72E+05	5.00E+06	2.50E+13	3.22E+13	3.81E+12
5.51E+06	5.67E+06	-1.57E+05	2.46E+10	3.04E+13	3.13E+13
4.36E+06	5.51E+06	-1.16E+06	1.34E+12	1.90E+13	2.40E+13
3.61E+06	4.36E+06	-7.49E+05	5.62E+11	1.30E+13	1.57E+13
-6.88E+06	3.61E+06	-1.05E+07	1.10E+14	4.73E+13	-2.48E+13
-5.89E+06	-6.88E+06	9.88E+05	9.75E+11	3.47E+13	4.05E+13
2.44E+06	5.89E+06	-3.45E+06	9.56E+14	9.59E+14	4.61E+14

TRANSFORMED REGRESSION D-W

SLOPE	0.246594912
INTERCEPT	-150463.5557
DURBIN-WATSON	1.49
R-SQUARED	

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
3.68E+06				1.35E+13	
8.49E+05	3.68E+06	-2.83E+06	7.99E+12	7.21E+11	3.12E+12
-4.96E+06	8.49E+05	-5.81E+06	3.38E+13	2.46E+13	-4.21E+12
-9.77E+05	-4.96E+06	3.99E+06	1.59E+13	9.55E+11	4.85E+12
-4.61E+06	-9.77E+05	-3.64E+06	1.32E+13	2.13E+13	4.51E+12
-4.15E+06	-4.61E+06	4.64E+05	2.15E+11	1.72E+13	1.91E+13
1.69E+06	-4.15E+06	5.84E+06	3.41E+13	2.85E+12	-7.00E+12
3.80E+06	1.69E+06	2.12E+06	4.48E+12	1.45E+13	6.42E+12
-1.17E+05	3.80E+06	-3.92E+06	1.54E+13	1.37E+10	-4.45E+11
-1.73E+06	-1.17E+05	-1.61E+06	2.60E+12	2.99E+12	2.02E+11
9.35E+05	-1.73E+06	2.66E+06	7.10E+12	8.74E+11	-1.62E+12
8.51E+05	9.35E+05	-8.46E+04	7.15E+09	7.23E+11	7.95E+11
-4.32E+06	8.51E+05	-5.17E+06	2.67E+13	1.87E+13	-3.67E+12
-3.93E+06	-4.32E+06	3.88E+05	1.51E+11	1.55E+13	1.70E+13
-1.70E+07	-3.93E+06	-1.31E+07	1.72E+14	2.90E+14	6.70E+13
4.32E+06	-1.70E+07	2.14E+07	4.56E+14	1.87E+13	-7.36E+13
8.90E+06	4.32E+06	4.58E+06	2.10E+13	7.93E+13	3.85E+13
4.49E+06	8.90E+06	-4.42E+06	1.95E+13	2.01E+13	3.99E+13
3.24E+06	4.49E+06	-1.25E+06	1.55E+12	1.05E+13	1.45E+13
1.28E+06	3.24E+06	-1.96E+06	3.83E+12	1.64E+12	4.15E+12
1.17E+05	1.28E+06	-1.17E+06	1.36E+12	1.37E+10	1.50E+11
8.05E+05	1.17E+05	6.88E+05	4.74E+11	6.49E+11	9.42E+10
6.87E+06	8.05E+05	6.06E+06	3.67E+13	4.71E+13	5.53E+12
3.89E+06	6.87E+06	-2.98E+06	8.87E+12	1.51E+13	2.67E+13
2.90E+06	3.89E+06	-9.87E+05	9.74E+11	8.41E+12	1.13E+13
2.76E+06	2.90E+06	-1.38E+05	1.90E+10	7.64E+12	8.02E+12
-7.98E+06	2.76E+06	-1.07E+07	1.15E+14	6.37E+13	-2.20E+13
-1.57E+06	-7.98E+06	6.41E+06	4.11E+13	2.45E+12	1.25E+13
2.37E-06	1.57E+06	-5.24E+06	1.04E+15	7.00E+14	1.72E+14

Bay State Gas Company
Marginal Cost Study
Comparison to Previous Results

		Dkt. 95-52 MCS	Handy Whitman	Restated MCS	Current MCS
1	Resi Htg Customer Cost	$ 23.66	1.286	$ 30.42	$ 32.45
2	Resi Htg Distribution Capacity Cost	$ 77.69	1.286	$ 99.87	$ 96.65
3	Design Day Demand	1.2		1.2	1.2
4	Annual Capacity Cost	$ 95.07		$ 122.22	$ 118.27
5	Typical Customer Annual Cost	$ 378.99		$ 487.21	$ 507.72
6	Customers	170,449		170,449	222,171
7	Total Marginal Costs	64,598,450		83,043,822	112,801,817
8					
9	Average Costs	71,791,447	1.29	92,290,699	107,161,232
				541	482

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-2 Refer to Exh. BSG/JLH-3. Please discuss whether the method of estimating the marginal capacity-related production expenses complies with the Department's directives set in Fitchburg Gas and Electric Light Company, D.T.E. 02-24/25 (2002) and Boston Gas Company, D.T.E. 03-40 (2003). Specifically, please answer the following questions:

a) Are the time series data used no less than 30 years in length?
b) Has the Company used multiple variable regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
c) Are the appropriate tests and remedial procedures for multicollinearity, heteroskedasticity, and autocorrelation performed and presented? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
d) Has the Company tested and presented alternative functional forms (e.g., linear, logarithmic, parabolic, or other) of regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation.

Response: For capacity-related production expense, Bay State Gas Company employed a marginal cost approach that is forward looking instead of a time series regression of historical data. Thus, the directives referenced in this request do not apply. Due to changes in gas production technology occurring during the historical period, the Company's historical data does not accurately reflect the expected marginal capacity-related production costs to be faced by the Company in the future.

Marginal capacity-related production expenses represent the fixed costs associated with the utility's propane air and LNG vaporization facilities. My analysis began by examining the available historic accounting data. The Company's previous marginal cost studies utilized accounting data beginning with 1976, representing 29 years of historical data. Preliminary discussions with the Company's planning personnel indicated that over this historic period, the Company had retired a number of small peaking facilities, the last retirement occurring in 2002. Furthermore, technological improvements in these facilities have resulted in lower operating and maintenance costs compared to the older units. An initial statistical analysis of the data is shown on Schedule JLH-3-4, page 4 of 6.

The analysis shows a declining trend both in expense vs. design day demand and in the time series analysis of unit costs. These trends are consistent with information provided by the Company's planning personnel. However, the Company believes that these trends are neither meaningful nor accurate for the purpose of measuring long-run marginal costs. The Company will continue to operate its existing peaking facilities to serve loads up to its current level of supply capacity. Beyond that, the long run marginal costs for production consist of the costs to construct additional capacity and to operate that capacity. Since the Company did not have any manufacturer's data to suggest the forward-looking costs to operate new peaking facilities, the average cost of operating and maintaining the peaking facilities for the last two years was employed as a reasonable proxy. Since the Company's last retirements were in 2002, the last two years represent an estimate of the costs to operate and maintain the existing units on a unit-cost basis. The cost to operate new facilities may be slightly less than the remaining existing units. However, any changes to this figure would be a few cents per design day dekatherm, a very small figure compared to the total production-related capacity costs of nearly $50 per dekatherm. Additional analysis to further refine this figure would have only an insignificant impact upon total production-related capacity costs. The remainder of this response addresses the statistical analysis shown on Schedule JLH-3-4, page 4 of 6, which was presented but not employed.

a) Twenty-nine years of data was used since it was readily available and roughly equivalent to the 30-year period suggested by the Department. The Company also notes that recent FERC data retention policies have shortened the time periods for which certain historical data must be retained. FERC document retention policies were relaxed in accordance with a ruling in Docket No RM99-8-00, Preservation of Records of Public Utilities and Licensees, Natural Gas Companies, and Oil Pipeline Companies, issued July 27, 2000. Based on recommendations from the OMB and a full investigation, the FERC requirement for most accounting data necessary for marginal cost studies (such as general ledger information) was reduced from 25 to 10 years. FERC data retention requirements for sales data and records of maximum demand are even shorter.

For Bay State, data to separately identify the number of firm customers, firm sendout and firm peak day sendout requirements are not normally retained for any extended period, but may be developed from data contained in annual DTE reports. NiSource corporate records for Bay State currently include electronic general ledger information back to 1999 and DTE/DPU reports back to 1991. Bay State maintains additional general ledger records dating back to the mid-1970's in its long term storage. DPU reports for 1975 are not readily available. Bay State may have placed a hard copy of older general ledger and DPU reports in its long term warehouse storage located in its Springfield Division, however the indexing and location of specific documents is problematic and labor intensive. In preparing

for this rate case, the Company determined that, in conducting previous marginal cost studies, MAC had established a database dating back to 1976, constituting 29 years of data. The Company concluded that the addition of one more year of data, even if such data were available, would not materially add to the accuracy of the analysis.

b) No. A second independent variable could not be practically produced.

c) Yes. See the JLH Workpapers provided in Volume III of the Company's initial filing, pages 430 to 432.

d) No. As explained above, long-run marginal costs were not estimated using econometric techniques but instead were based on information provided by planning personnel.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-3 Refer to Exh. BSG/JLH-3. Please discuss whether the method of estimating the marginal capacity-related transmission and distribution expenses complies with the Department's directives set in Fitchburg Gas and Electric Light Company, D.T.E. 02-24/25 (2002) and Boston Gas Company, D.T.E. 03-40 (2003). Specifically, please answer the following questions:

a) Are the time series data used no less than 30 years in length?
b) Has the Company used multiple variable regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
c) Are the appropriate tests and remedial procedures for multicollinearity, heteroskedasticity, and autocorrelation performed and presented? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
d) Has the Company tested and presented alternative functional forms (e.g., linear, logarithmic, parabolic, or other) of regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation.

Response:

a) Twenty-nine years of data was used since it was readily available and roughly equivalent to the 30-year period requested by the Department. The addition of one more year of data, even if such data were available, would not materially add to the accuracy of the analysis.

b) The Company attempted specifications with multiple independent variables. In Volume III of JLH Workpapers, pages 418-420, the year and the total number of firm customers were evaluated as a possible set of independent variables and rejected. This same spreadsheet template was used to evaluate other combinations of independent and dependent variables; however, the results were overwritten in the process of evaluating alternatives. For the purposes of this response, these cases have been reproduced and included as Attachment 1, DTE 2-3. The spreadsheet used to perform this analysis, as well as all other econometric analyses, is provided in response to DTE 2-7.

c) Yes. The JLH Workpapers are included on pages 415-420 of Volume III and in the attachment to this response.

d) Yes. See the response to Part b) above.

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2 Distribution Capacity-Related Expenses

R SQUARED, ADJUSTED =		0.77
DURBIN WATSON STATISTIC =		0.97
		Before Cochrane Orcott Adjustment
DPEUC =	Dist Plt Expense Unit Cost	X-VARIABLE COEFF. t STATISTIC
CONSTANT		1427 9.728
YEAR =	Year	$ (0.70701) -9.594
=		

Line Estimate Results

(0.70701)	1,427	#N/A	#N/A
0.073695	147	#N/A	#N/A
0.773184	3	#N/A	#N/A
92.0393	27	#N/A	#N/A
1,014.71	297.67	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPEUC	YEAR			
YEAR	DIST PLT EXPENSE UNIT COST	YEAR	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	32.12	1,976	29.65	2.47	32.12
1977	38.22	1,977	28.94	9.28	38.22
1978	33.32	1,978	28.23	5.09	33.32
1979	23.84	1,979	27.53	(3.69)	23.84
1980	27.31	1,980	26.82	0.49	27.31
1981	25.86	1,981	26.11	(0.26)	25.86
1982	23.47	1,982	25.41	(1.93)	23.47
1983	20.85	1,983	24.70	(3.85)	20.85
1984	21.05	1,984	23.99	(2.94)	21.05
1985	26.46	1,985	23.29	3.17	26.46
1986	20.18	1,986	22.58	(2.40)	20.18
1987	19.46	1,987	21.87	(2.41)	19.46
1988	20.67	1,988	21.16	(0.50)	20.67
1989	19.65	1,989	20.46	(0.81)	19.65
1990	18.23	1,990	19.75	(1.52)	18.23
1991	15.50	1,991	19.04	(3.54)	15.50
1992	13.34	1,992	18.34	(4.99)	13.34
1993	12.77	1,993	17.63	(4.86)	12.77
1994	13.98	1,994	16.92	(2.94)	13.98
1995	16.95	1,995	16.22	0.74	16.95
1996	17.81	1,996	15.51	2.30	17.81
1997	15.09	1,997	14.80	0.29	15.09
1998	14.14	1,998	14.09	0.04	14.14
1999	17.16	1,999	13.39	3.77	17.16
2000	16.62	2,000	12.68	3.94	16.62
2001	14.21	2,001	11.97	2.24	14.21
2002	11.68	2,002	11.27	0.41	11.68
2003	11.41	2,003	10.56	0.85	11.41
2004	11.39	2,004	9.85	1.54	11.39

REGRESSION MODEL NO. 2 Distribution Capacity-Related Expenses WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.47
DURBIN WATSON STATISTIC = 1.67
After Cochrane Orcott Adjustment
X-VARIABLE COEFF. t STATISTIC

	648	4.831
$	(0.65427)	-4.763

Line Estimate Results

(0.65427)	648	#N/A	#N/A
0.137352	134	#N/A	#N/A
0.466012	3	#N/A	#N/A
22.6903	26	#N/A	#N/A
188	215	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	Y UNIT COST	TRANSFORMED VARIABLES X1 YEAR	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE	RHO 0.50965 ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976													2			
1977	22	970	-	-	13.42	8.43	29.79	28.94	0.85	29.8	38.2	(8.4)	9	2	86	23
1978	14	970	-	-	13.10	0.74	32.58	28.23	4.35	32.6	33.3	(0.7)	5	9	26	47
1979	7	971	-	-	12.78	(5.92)	29.76	27.53	2.24	29.8	23.8	5.9	(4)	5	14	(19)
1980	15	971	-	-	12.46	2.70	24.61	26.82	(2.21)	24.6	27.3	(2.7)	0	(4)	0	(2)
1981	12	972	-	-	12.14	(0.20)	26.06	26.11	(0.06)	26.1	25.9	0.2	(0)	0	0	(0)
1982	10	972	-	-	11.82	(1.52)	25.00	25.41	(0.41)	25.0	23.5	1.5	(2)	(0)	4	0
1983	9	973	-	-	11.50	(2.61)	23.46	24.70	(1.24)	23.5	20.8	2.6	(4)	(2)	15	7
1984	10	973	-	-	11.18	(0.74)	21.80	23.99	(2.19)	22	21	1	(3)	(4)	9	11
1985	16	974	-	-	10.86	4.87	21.59	23.29	(1.70)	22	26	(5)	3	(3)	10	(9)
1986	7	974	-	-	10.53	(3.84)	24.02	22.58	1.44	24	20	4	(2)	3	6	(8)
1987	9	975	-	-	10.21	(1.04)	20.50	21.87	(1.37)	20	19	1	(2)	(2)	6	6
1988	11	975	-	-	9.89	0.86	19.81	21.16	(1.36)	20	21	(1)	(0)	(2)	0	1
1989	9	976	-	-	9.57	(0.45)	20.11	20.46	(0.35)	20	20	0	(1)	(0)	1	0
1990	8	976	-	-	9.25	(1.03)	19.27	19.75	(0.48)	19	18	1	(2)	(1)	2	1
1991	6	977	-	-	8.93	(2.72)	18.22	19.04	(0.82)	18	16	3	(4)	(2)	13	5
1992	5	977	-	-	8.61	(3.17)	16.51	18.34	(1.83)	17	13	3	(5)	(4)	25	18
1993	6	978	-	-	8.29	(2.32)	15.09	17.63	(2.54)	15	13	2	(5)	(5)	24	24
1994	7	978	-	-	7.97	(0.50)	14.48	16.92	(2.44)	14	14	0	(3)	(5)	9	14
1995	10	979	-	-	7.65	2.18	14.77	16.22	(1.44)	15	17	(2)	1	(3)	1	(2)
1996	9	979	-	-	7.33	1.84	15.97	15.51	0.46	16	18	(2)	2	1	5	2
1997	6	980	-	-	7.01	(0.99)	16.08	14.80	1.28	16	15	1	0	2	0	1
1998	6	980	-	-	6.68	(0.24)	14.38	14.09	0.28	14	14	0	0	0	0	0
1999	10	981	-	-	6.36	3.59	13.57	13.39	0.18	14	17	(4)	4	0	14	0
2000	8	981	-	-	6.04	1.83	14.79	12.68	2.11	15	17	(2)	4	4	15	15
2001	6	982	-	-	5.72	0.02	14.19	11.97	2.22	14	14	(0)	2	4	5	9
2002	4	982	-	-	5.40	(0.97)	12.64	11.27	1.38	13	12	1	0	2	0	1
2003	5	983	-	-	5.08	0.38	11.03	10.56	0.47	11	11	(0)	1	0	1	0
2004	6	983	-	-	4.76	0.82	10.57	9.85	0.72	11	11	(1)	2	1	2	1
												SUM	(2)	(2)	292	149

ORIGINAL REGRESSION D-W
SLOPE 0.50289404

INTERCEPT -0.060588531

DURBIN-WATSON 0.97
R-SQUARED 0.773

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
2				6	
9	2	7	46	86	23
5	9	(4)	18	26	47
(4)	5	(9)	77	14	(19)
0	(4)	4	17	0	(2)
(0)	0	(1)	1	0	(0)
(2)	(0)	(2)	3	4	0
(4)	(2)	(2)	4	15	7
(3)	(4)	1	1	9	11
3	(3)	6	37	10	(9)
(2)	3	(6)	31	6	(8)
(2)	(2)	(0)	0	6	6
(0)	(2)	2	4	0	1
(1)	(0)	(0)	0	1	0
(2)	(1)	(1)	1	2	1
(4)	(2)	(2)	4	13	5
(5)	(4)	(1)	2	25	18
(5)	(5)	0	0	24	24
(3)	(5)	2	4	9	14
1	(3)	4	14	1	(2)
2	1	2	2	5	2
0	2	(2)	4	0	1
0	0	(0)	0	0	0
4	0	4	14	14	0
4	4	0	0	15	15
2	4	(2)	3	5	9
0	2	(2)	3	0	1
1	0	0	0	1	0
2	1	1	0	2	1
(2)	(2)	(1)	290	298	149

TRANSFORMED REGRESSION D-W
SLOPE -0.004252628

INTERCEPT -0.312287385

DURBIN-WATSON 1.67
R-SQUARED

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
8				71	
1	8	(8)	59	1	6
(6)	1	(7)	44	35	(4)
3	(6)	9	74	7	(16)
(0)	3	(3)	8	0	(1)
(2)	(0)	(1)	2	2	0
(3)	(2)	(1)	1	7	4
(1)	(3)	2	3	1	2
5	(1)	6	32	24	(4)
(4)	5	(9)	78	15	(19)
(1)	(4)	3	8	1	4
1	(1)	2	4	1	(1)
(0)	1	(1)	2	0	(0)
(1)	(0)	(1)	0	1	0
(3)	(1)	(2)	3	7	3
(3)	(3)	(0)	0	10	9
(2)	(3)	1	1	5	7
(0)	(2)	2	3	0	1
2	(0)	3	7	5	(1)
2	2	(0)	0	3	4
(1)	2	(3)	8	1	(2)
(0)	(1)	1	1	0	0
4	(0)	4	15	13	(1)
2	4	(2)	3	3	7
0	2	(2)	3	0	0
(1)	0	(1)	1	1	(0)
0	(1)	1	2	0	(0)
1	0	0	0	1	0
(0)	(1)	(8)	361	215	(1)

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2A Distribution Capacity-Related Expenses

R SQUARED, ADJUSTED =		0.78
DURBIN WATSON STATISTIC =		1.02
		Before Cochrane Orcott Adjustment
DPEUC =	Dist Plt Expense Unit Cost	X-VARIABLE COEFF. t STATISTIC
CONSTANT		2070 2.431
YEAR =	Year	$ (1.04011) -2.362
CUST =	Cust'S	0.000 0.7674

Line Estimate Results

0.00008	(1)	2,070	#N/A
0.000107	0	852	#N/A
0.778208	3	#N/A	#N/A
45.6134	26	#N/A	#N/A
1,021.30	291.08	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPEUC	YEAR	CUST

YEAR	DIST PLT EXPENSE UNIT COST	YEAR	CUST'S	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	32.12	1,976	184779	30.46	1.66	32.12
1977	38.22	1,977	184321	29.38	8.84	38.22
1978	33.32	1,978	185232.00	28.42	4.91	33.32
1979	23.84	1,979	189091.00	27.69	(3.85)	23.84
1980	27.31	1,980	192620.00	26.95	0.37	27.31
1981	25.86	1,981	194544.00	26.06	(0.21)	25.86
1982	23.47	1,982	195276.00	25.08	(1.61)	23.47
1983	20.85	1,983	197836.00	24.26	(3.41)	20.85
1984	21.05	1,984	195276.00	23.00	(1.95)	21.05
1985	26.46	1,985	202626.00	22.57	3.89	26.46
1986	20.18	1,986	207842.00	21.96	(1.78)	20.18
1987	19.46	1,987	213657.00	21.40	(1.94)	19.46
1988	20.67	1,988	219556.00	20.85	(0.18)	20.67
1989	19.65	1,989	226230.00	20.36	(0.71)	19.65
1990	18.23	1,990	230551.00	19.67	(1.44)	18.23
1991	15.50	1,991	255325.92	20.67	(5.17)	15.50
1992	13.34	1,992	241232.00	18.47	(5.13)	13.34
1993	12.77	1,993	245550.00	17.79	(5.01)	12.77
1994	13.98	1,994	248710.00	17.01	(3.03)	13.98
1995	16.95	1,995	252840.84	16.31	0.65	16.95
1996	17.81	1,996	257364.00	15.64	2.17	17.81
1997	15.09	1,997	261170.00	14.92	0.18	15.09
1998	14.14	1,998	265545.00	14.24	(0.10)	14.14
1999	17.16	1,999	272085.80	13.74	3.43	17.16
2000	16.62	2,000	273808.00	12.84	3.78	16.62
2001	14.21	2,001	276749.00	12.04	2.17	14.21
2002	11.68	2,002	279495.00	11.23	0.45	11.68
2003	11.41	2,003	281227	10.33	1.08	11.41
2004	11.39	2,004	283032	9.44	1.96	11.39

REGRESSION MODEL NO. 2A Distribution Capacity-Related Expenses (Multi-regression) WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.49
DURBIN WATSON STATISTIC = 1.63
After Cochrane Orcott Adjustment
X-VARIABLE COEFF. t STATISTIC

	696	1.392
$	(0.66914)	-1.337
	0.000003	0.024

Line Estimate Results

0.00000	(1)	696	#N/A
0.000116	1	500	#N/A
0.493485	3	#N/A	#N/A
12.1784	25	#N/A	#N/A
210	216	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	Y UNIT COST	TRANSFORMED VARIABLES X1 YEAR	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE	RHO 0.48429 ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976													2			
1977	23	1,020	94,834	-	14.18	8.48	29.74	29.38	0.36	29.7	38.2	(8.5)	9	2	78	15
1978	15	1,021	95,967	-	13.84	0.97	32.35	28.42	3.93	32.3	33.3	(1.0)	5	9	24	43
1979	8	1,021	99,385	-	13.50	(5.80)	29.64	27.69	1.95	29.6	23.8	5.8	(4)	5	15	(19)
1980	16	1,022	101,045	-	13.16	2.60	24.71	26.95	(2.24)	24.7	27.3	(2.6)	0	(4)	0	(1)
1981	13	1,022	101,260	-	12.82	(0.19)	26.05	26.06	(0.02)	26.0	25.9	0.2	(0)	0	0	(0)
1982	11	1,023	101,060	-	12.47	(1.52)	25.00	25.08	(0.09)	25.0	23.5	1.5	(2)	(0)	3	0
1983	9	1,023	103,265	-	12.13	(2.66)	23.50	24.26	(0.75)	23.5	20.8	2.7	(3)	(2)	12	5
1984	11	1,024	99,466	-	11.78	(0.82)	21.87	23.00	(1.13)	22	21	1	(2)	(3)	4	7
1985	16	1,024	108,055	-	11.46	4.80	21.65	22.57	(0.92)	22	26	(5)	4	(2)	15	(8)
1986	7	1,025	109,712	-	11.12	(3.75)	23.93	21.96	1.97	24	20	4	(2)	4	3	(7)
1987	10	1,025	113,001	-	10.78	(1.10)	20.55	21.40	(0.84)	21	19	1	(2)	(2)	4	3
1988	11	1,026	116,084	-	10.45	0.80	19.87	20.85	(0.98)	20	21	(1)	(0)	(2)	0	0
1989	10	1,026	119,901	-	10.11	(0.47)	20.12	20.36	(0.24)	20	20	0	(1)	(0)	0	0
1990	9	1,027	120,990	-	9.77	(1.05)	19.29	19.67	(0.39)	19	18	1	(1)	(1)	2	1
1991	7	1,027	143,672	-	9.49	(2.81)	18.32	20.67	(2.36)	18	16	3	(5)	(1)	27	7
1992	6	1,028	117,580	-	9.07	(3.23)	16.58	18.47	(1.89)	17	13	3	(5)	(5)	26	27
1993	6	1,028	128,723	-	8.76	(2.44)	15.22	17.79	(2.57)	15	13	2	(5)	(5)	25	26
1994	8	1,029	129,792	-	8.41	(0.62)	14.60	17.01	(2.41)	15	14	1	(3)	(5)	9	15
1995	10	1,029	132,393	-	8.08	2.11	14.85	16.31	(1.46)	15	17	(2)	1	(3)	0	(2)
1996	10	1,030	134,915	-	7.74	1.86	15.95	15.64	0.31	16	18	(2)	2	1	5	1
1997	6	1,030	136,531	-	7.40	(0.93)	16.02	14.92	1.11	16	15	1	0	2	0	0
1998	7	1,031	139,063	-	7.06	(0.23)	14.37	14.24	0.13	14	14	0	(0)	0	0	(0)
1999	10	1,031	143,485	-	6.73	3.59	13.57	13.74	(0.16)	14	17	(4)	3	(0)	12	(0)
2000	8	1,032	142,039	-	6.38	1.93	14.69	12.84	1.85	15	17	(2)	4	3	14	13
2001	6	1,032	144,146	-	6.04	0.12	14.09	12.04	2.05	14	14	(0)	2	4	5	8
2002	5	1,033	145,468	-	5.70	(0.90)	12.58	11.23	1.35	13	12	1	0	2	0	1
2003	6	1,033	145,870	-	5.35	0.40	11.01	10.33	0.68	11	11	(0)	1	0	1	0
2004	6	1,034	146,836	-	5.01	0.86	10.54	9.44	1.10	11	11	(1)	2	1	4	2
													SUM	(2)	(2)	288	140

ORIGINAL REGRESSION D-W

SLOPE	0.485925328
INTERCEPT	-0.025360365
DURBIN-WATSON	1.02
R-SQUARED	0.778

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
2				3	
9	2	7	52	78	15
5	9	(4)	15	24	43
(4)	5	(9)	77	15	(19)
0	(4)	4	18	0	(1)
(0)	0	(1)	0	0	(0)
(2)	(0)	(1)	2	3	0
(3)	(2)	(2)	3	12	5
(2)	(3)	1	2	4	7
4	(2)	6	34	15	(8)
(2)	4	(6)	32	3	(7)
(2)	(2)	(0)	0	4	3
(0)	(2)	2	3	0	0
(1)	(0)	(1)	0	0	0
(1)	(1)	(1)	1	2	1
(5)	(1)	(4)	14	27	7
(5)	(5)	0	0	26	27
(5)	(5)	0	0	25	26
(3)	(5)	2	4	9	15
1	(3)	4	13	0	(2)
2	1	2	2	5	1
0	2	(2)	4	0	0
(0)	0	(0)	0	0	(0)
3	(0)	4	12	12	(0)
4	3	0	0	14	13
2	4	(2)	3	5	8
0	2	(2)	3	0	1
1	0	1	0	1	0
2	1	1	1	4	2
(2)	(2)	0	296	291	140

TRANSFORMED REGRESSION D-W

SLOPE	0.016159045
INTERCEPT	-0.313674189
DURBIN-WATSON	1.63
R-SQUARED	

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
8				72	
1	8	(8)	56	1	8
(6)	1	(7)	46	34	(6)
3	(6)	8	71	7	(15)
(0)	3	(3)	8	0	(0)
(2)	(0)	(1)	2	2	0
(3)	(2)	(1)	1	7	4
(1)	(3)	2	3	1	2
5	(1)	6	32	23	(4)
(4)	5	(9)	73	14	(18)
(1)	(4)	3	7	1	4
1	(1)	2	4	1	(1)
(0)	1	(1)	2	0	(0)
(1)	(0)	(1)	0	1	0
(3)	(1)	(2)	3	8	3
(3)	(3)	(0)	0	10	9
(2)	(3)	1	1	6	8
(1)	(2)	2	3	0	2
2	(1)	3	7	4	(1)
2	2	(0)	0	3	4
(1)	2	(3)	8	1	(2)
(0)	(1)	1	0	0	0
4	(0)	4	15	13	(1)
2	4	(2)	3	4	7
0	2	(2)	3	0	0
(1)	0	(1)	1	1	(0)
0	(1)	1	2	0	(0)
1	0	0	0	1	0
0	(1)	(8)	351	216	4

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2B Distribution Capacity-Related Unit cost vs Year and Plt Investment

R SQUARED, ADJUSTED =	0.77	
DURBIN WATSON STATISTIC =	0.98	
	Before Cochrane Orcott Adjustment	
DPEUC = Dist Plt Expense Unit Cost	X-VARIABLE COEFF.	t STATISTIC
CONSTANT	1721	1.689
YEAR = Year	$ (0.85576)	-1.660
DTI = Distr Plant Invest	2.47E-08	0.2917

Line Estimate Results

2.47E-08	(1)	1,721	#N/A
8.46E-08	1	1,019	#N/A
0.773924	3	#N/A	#N/A
44.5028	26	#N/A	#N/A
1.02E+03	2.97E+02	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR DPEUC YEAR DTI

YEAR	DIST PLT EXPENSE UNIT COST	YEAR	DISTR PLANT INVEST	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	32.12	1,976	-	29.81	2.31	32.12
1977	38.22	1,977	4,271,252	29.06	9.16	38.22
1978	33.32	1,978	8,709,537	28.31	5.01	33.32
1979	23.84	1,979	14,171,669	27.59	(3.75)	23.84
1980	27.31	1,980	17,555,811	26.82	0.49	27.31
1981	25.86	1,981	20,482,450	26.04	(0.18)	25.86
1982	23.47	1,982	25,131,748	25.29	(1.82)	23.47
1983	20.85	1,983	26,864,548	24.48	(3.64)	20.85
1984	21.05	1,984	30,623,182	23.72	(2.66)	21.05
1985	26.46	1,985	37,471,980	23.03	3.42	26.46
1986	20.18	1,986	45,457,524	22.37	(2.19)	20.18
1987	19.46	1,987	56,022,555	21.78	(2.32)	19.46
1988	20.67	1,988	64,157,785	21.12	(0.45)	20.67
1989	19.65	1,989	70,317,222	20.42	(0.77)	19.65
1990	18.23	1,990	77,529,058	19.74	(1.51)	18.23
1991	15.50	1,991	85,179,871	19.07	(3.57)	15.50
1992	13.34	1,992	90,741,028	18.36	(5.01)	13.34
1993	12.77	1,993	109,280,404	17.96	(5.18)	12.77
1994	13.98	1,994	115,788,625	17.26	(3.28)	13.98
1995	16.95	1,995	120,821,863	16.53	0.42	16.95
1996	17.81	1,996	124,794,681	15.77	2.04	17.81
1997	15.09	1,997	127,968,212	15.00	0.10	15.09
1998	14.14	1,998	131,965,544	14.24	(0.10)	14.14
1999	17.16	1,999	135,453,840	13.47	3.69	17.16
2000	16.62	2,000	138,343,843	12.68	3.93	16.62
2001	14.21	2,001	141,063,792	11.90	2.32	14.21
2002	11.68	2,002	143,813,174	11.11	0.57	11.68
2003	11.41	2,003	145,956,482	10.30	1.10	11.41
2004	11.39	2,004	149,025,071	9.52	1.87	11.39

REGRESSION MODEL NO. 2B Distribution Capacity-Related Unit cost vs Year and Plt Investment WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.47
DURBIN WATSON STATISTIC = 1.67
After Cochrane Orcott Adjustment

X-VARIABLE COEFF.	t STATISTIC
579	0.784
$ (0.57758)	-0.765
-1.28E-08	-0.104

Line Estimate Results

-1.28E-08	(1)	579	#N/A
1.23E-07	1	739	#N/A
0.471170	3	#N/A	#N/A
11.1371	25	#N/A	#N/A
192	215	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	Y UNIT COST	TRANSFORMED VARIABLES X1 YEAR	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE	RHO	0.50522 ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976														2			
1977	22	979	4,271,252	-	13.53	8.46	30	29	1	29.8	38.2	(8.5)		9	2	84	21
1978	14	979	5,551,602	-	13.21	0.80	33	28	4	32.5	33.3	(0.8)		5	9	25	46
1979	7	980	9,771,410	-	12.89	(5.88)	30	28	2	29.7	23.8	5.9		(4)	5	14	(19)
1980	15	980	10,395,957	-	12.59	2.67	25	27	(2)	24.6	27.3	(2.7)		0	(4)	0	(2)
1981	12	981	11,612,849	-	12.29	(0.23)	26	26	0	26.1	25.9	0.2		(0)	0	0	(0)
1982	10	981	14,783,542	-	11.97	(1.56)	25	25	(0)	25.0	23.5	1.6		(2)	(0)	3	0
1983	9	982	14,167,408	-	11.69	(2.70)	24	24	(1)	23.5	20.8	2.7		(4)	(2)	13	7
1984	11	982	17,050,592	-	11.36	(0.84)	22	24	(2)	22	21	1		(3)	(4)	7	10
1985	16	983	22,000,441	-	11.02	4.80	22	23	(1)	22	26	(5)		3	(3)	12	(9)
1986	7	983	26,525,815	-	10.67	(3.86)	24	22	2	24	20	4		(2)	3	5	(8)
1987	9	984	33,056,364	-	10.30	(1.04)	20	22	(1)	20	19	1		(2)	(2)	5	5
1988	11	984	35,853,898	-	9.98	0.86	20	21	(1)	20	21	(1)		(0)	(2)	0	1
1989	9	985	37,903,228	-	9.67	(0.46)	20	20	(0)	20	20	0		(1)	(0)	1	0
1990	8	985	42,003,175	-	9.33	(1.02)	19	20	(0)	19	18	1		(2)	(1)	2	1
1991	6	986	46,010,402	-	8.99	(2.70)	18	19	(1)	18	16	3		(4)	(2)	13	5
1992	6	986	47,706,191	-	8.69	(3.18)	17	18	(2)	17	13	3		(5)	(4)	25	18
1993	6	987	63,435,942	-	8.20	(2.17)	15	18	(3)	15	13	2		(5)	(5)	27	26
1994	8	987	60,577,643	-	7.95	(0.42)	14	17	(3)	14	14	0		(3)	(5)	11	17
1995	10	988	62,322,778	-	7.64	2.25	15	17	(2)	15	17	(2)		0	(3)	0	(1)
1996	9	988	63,752,687	-	7.34	1.91	16	16	0	16	18	(2)		2	0	4	1
1997	6	989	64,919,059	-	7.04	(0.94)	16	15	1	16	15	1		0	2	0	0
1998	7	989	67,313,050	-	6.72	(0.21)	14	14	0	14	14	0		(0)	0	0	(0)
1999	10	990	68,781,802	-	6.41	3.60	14	13	0	14	17	(4)		4	(0)	14	(0)
2000	8	990	69,909,436	-	6.11	1.83	15	13	2	15	17	(2)		4	4	15	15
2001	6	991	71,169,290	-	5.81	0.00	14	12	2	14	14	(0)		2	4	5	9
2002	4	991	72,544,491	-	5.51	(1.01)	13	11	2	13	12	1		1	2	0	1
2003	6	992	73,298,747	-	5.21	0.29	11	10	1	11	11	(0)		1	1	1	1
2004	6	992	75,284,488	-	4.90	0.73	11	10	1	11	11	(1)		2	1	3	2
													SUM	(2)	(2)	291	147

ORIGINAL REGRESSION D-W
SLOPE 0.501734496

INTERCEPT -0.049026062

DURBIN-WATSON 0.98
R-SQUARED 0.774

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
2				5	
9	2	7	47	84	21
5	9	(4)	17	25	46
(4)	5	(9)	77	14	(19)
0	(4)	4	18	0	(2)
(0)	0	(1)	0	0	(0)
(2)	(0)	(2)	3	3	0
(4)	(2)	(2)	3	13	7
(3)	(4)	1	1	7	10
3	(3)	6	37	12	(9)
(2)	3	(6)	32	5	(8)
(2)	(2)	(0)	0	5	5
(0)	(2)	2	3	0	1
(1)	(0)	(0)	0	1	0
(2)	(1)	(1)	1	2	1
(4)	(2)	(2)	4	13	5
(5)	(4)	(1)	2	25	18
(5)	(5)	(0)	0	27	26
(3)	(5)	2	4	11	17
0	(3)	4	14	0	(1)
2	0	2	3	4	1
0	2	(2)	4	0	0
(0)	0	(0)	0	0	(0)
4	(0)	4	14	14	(0)
4	4	0	0	15	15
2	4	(2)	3	5	9
1	2	(2)	3	0	1
1	1	1	0	1	1
2	1	1	1	3	2
(2)	(2)	(0)	290	297	147

TRANSFORMED REGRESSION D-W
SLOPE -0.001836361

INTERCEPT -0.31350827

DURBIN-WATSON 1.67
R-SQUARED

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
8				72	
1	8	(8)	59	1	7
(6)	1	(7)	45	35	(5)
3	(6)	9	73	7	(16)
(0)	3	(3)	8	0	(1)
(2)	(0)	(1)	2	2	0
(3)	(2)	(1)	1	7	4
(1)	(3)	2	3	1	2
5	(1)	6	32	23	(4)
(4)	5	(9)	75	15	(19)
(1)	(4)	3	8	1	4
1	(1)	2	4	1	(1)
(0)	1	(1)	2	0	(0)
(1)	(0)	(1)	0	1	0
(3)	(1)	(2)	3	7	3
(3)	(3)	(0)	0	10	9
(2)	(3)	1	1	5	7
(0)	(2)	2	3	0	1
2	(0)	3	7	5	(1)
2	2	(0)	0	4	4
(1)	2	(3)	8	1	(2)
(0)	(1)	1	1	0	0
4	(0)	4	15	13	(1)
2	4	(2)	3	3	7
0	2	(2)	3	0	0
(1)	0	(1)	1	1	(0)
0	(1)	1	2	0	(0)
1	0	0	0	1	0
0	(1)	(8)	359	215	(0)

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2C Distribution Capacity-Related Expenses - Year and Plt Investment

R SQUARED, ADJUSTED =		0.13
DURBIN WATSON STATISTIC =		1.12
		Before Cochrane Orcott Adjustment
DPETC =	Distr Expense Total Cost	X-VARIABLE COEFF. t STATISTIC
CONSTANT		462729081 1.854
YEAR =	Year	(230,614) -1.827
DTI =	Distr Plant Invest	3.55% 1.7155

Line Estimate Results

3.55E-02	(230,614)	4.63E+08	#N/A
2.07E-02	126,217	2.50E+08	#N/A
0.125747	827,287	#N/A	#N/A
1.8698	26	#N/A	#N/A
2.56E+12	1.78E+13	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPETC	YEAR	DTI

YEAR	DISTR EXPENSE TOTAL COST	YEAR	DISTR PLANT INVEST	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	$7,266,430	1,976	-	7036111	230319	7266430
1977	$8,482,448	1,977	4,271,252	6957237	1525211	8482448
1978	$7,730,844	1,978	8,709,537	6884296	846549	7730844
1979	$6,092,196	1,979	14,171,669	6847728	-755532	6092196
1980	$6,854,979	1,980	17,555,811	6737338	117642	6854979
1981	$6,852,095	1,981	20,482,450	6610695	241401	6852095
1982	$6,643,007	1,982	25,131,748	6545250	97757	6643007
1983	$5,440,661	1,983	26,864,548	6376195	-935534	5440661
1984	$5,608,312	1,984	30,623,182	6279109	-670797	5608312
1985	$7,185,645	1,985	37,471,980	6291803	893841	7185645
1986	$5,901,049	1,986	45,457,524	6344681	-443632	5901049
1987	$5,985,548	1,987	56,022,555	6489597	-504049	5985548
1988	$6,556,706	1,988	64,157,785	6547992	8714	6556706
1989	$6,690,804	1,989	70,317,222	6536196	154608	6690804
1990	$6,686,164	1,990	77,529,058	6561788	124376	6686164
1991	$5,860,228	1,991	85,179,871	6602974	-742746	5860228
1992	$5,165,797	1,992	90,741,028	6569924	-1404127	5165797
1993	$5,183,455	1,993	109,280,404	6997933	-1814478	5183455
1994	$5,894,116	1,994	115,788,625	6998528	-1104412	5894116
1995	$7,395,029	1,995	120,821,863	6946723	448305	7395029
1996	$8,071,139	1,996	124,794,681	6857246	1213892	8071139
1997	$7,084,742	1,997	127,968,212	6739374	345368	7084742
1998	$6,745,913	1,998	131,965,544	6650768	95145	6745913
1999	$7,462,087	1,999	135,453,840	6544078	918009	7462087
2000	$7,403,537	2,000	138,343,843	6416134	987404	7403537
2001	$6,479,700	2,001	141,063,792	6282148	197553	6479700
2002	$5,433,491	2,002	143,813,174	6149208	-715717	5433491
2003	$6,227,392	2,003	145,956,482	5994736	232656	6227392
2004	$6,285,609	2,004	149,025,071	5873136	412473	6285609

REGRESSION MODEL NO. 2C Distribution Capacity-Related Expenses - Year and Plt Investment WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.04
DURBIN WATSON STATISTIC = 1.57
After Cochrane Orcott Adjustment

X-VARIABLE COEFF.	t STATISTIC
203195550	1.009
(178,671)	-0.990
2.79%	0.948

Line Estimate Results

2.79E-02	(178,671)	2.03E+08	#N/A
2.94E-02	180,415	2.01E+08	#N/A
0.038669	756,220	#N/A	#N/A
0.5028	25	#N/A	#N/A
5.75E+11	1.43E+13	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	Y TOTAL COST	TRANSFORMED VARIABLES X1 YEAR	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE	RHO 0.43548 ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
													230,319			
1976																
1977	5,318,092	1,116	4,271,252	-	3,828,756	1,489,336	6,993,112	6,957,237	35,875	6,993,112.0	8,482,448.1	(1,489,336.1)	1,525,211	230,319	2.33E+12	3.51E+11
1978	4,036,942	1,117	6,849,509	-	3,799,776	237,166	7,493,678	6,884,296	609,383	7,493,678.3	7,730,844.4	(237,166.1)	846,549	1,525,211	7.17E+11	1.29E+12
1979	2,725,599	1,118	10,378,875	-	3,797,313	(1,071,714)	7,163,910	6,847,728	316,182	7,163,910.1	6,092,195.9	1,071,714.2	(755,532)	846,549	5.71E+11	-6.40E+11
1980	4,201,974	1,118	11,384,390	-	3,724,484	477,491	6,377,489	6,737,338	(359,849)	6,377,488.6	6,854,979.2	(477,490.7)	117,642	(755,532)	1.38E+10	-8.89E+10
1981	3,866,916	1,119	12,837,316	-	3,664,128	202,788	6,649,307	6,610,695	38,612	6,649,307.0	6,852,095.2	(202,788.2)	241,401	117,642	5.83E+10	2.84E+10
1982	3,659,085	1,119	16,212,134	-	3,657,356	1,728	6,641,279	6,545,250	96,029	6,641,279.3	6,643,007.4	(1,728.1)	97,757	241,401	9.56E+09	2.36E+10
1983	2,547,791	1,120	15,920,275	-	3,548,355	(1,000,564)	6,441,225	6,376,195	65,030	6,441,225.4	5,440,661.2	1,000,564.2	(935,534)	97,757	8.75E+11	-9.15E+10
1984	3,239,035	1,120	18,924,317	-	3,531,246	(292,211)	5,900,523	6,279,109	(378,586)	5,900,523	5,608,312	292,211	(670,797)	(935,534)	4.50E+11	6.28E+11
1985	4,743,359	1,121	24,136,320	-	3,575,696	1,167,663	6,017,982	6,291,803	(273,822)	6,017,982	7,185,645	(1,167,663)	893,841	(670,797)	7.99E+11	-6.00E+11
1986	2,771,874	1,122	29,139,377	-	3,614,321	(842,447)	6,743,497	6,344,881	398,616	6,743,497	5,901,049	842,447	(443,832)	893,841	1.97E+11	-3.97E+11
1987	3,415,783	1,122	36,226,895	-	3,711,062	(295,279)	6,280,827	6,489,597	(208,770)	6,280,827	5,985,548	295,279	(504,049)	(443,832)	2.54E+11	2.24E+11
1988	3,950,144	1,123	39,761,309	-	3,708,740	241,404	6,315,302	6,547,992	(232,690)	6,315,302	6,556,706	(241,404)	8,714	(504,049)	7.59E+07	-4.39E+09
1989	3,835,516	1,123	42,378,048	-	3,680,832	154,684	6,536,120	6,536,196	(76)	6,536,120	6,690,804	(154,684)	154,608	8,714	2.39E+10	1.35E+09
1990	3,772,479	1,124	46,907,597	-	3,706,255	66,224	6,619,940	6,561,788	58,152	6,619,940	6,686,164	(66,224)	124,376	154,608	1.55E+10	1.92E+10
1991	2,948,565	1,124	51,417,829	-	3,731,140	(782,575)	6,642,803	6,602,974	39,829	6,642,803	5,860,228	782,575	(742,746)	124,376	5.52E+11	-9.24E+10
1992	2,613,808	1,125	53,647,241	-	3,692,433	(1,078,625)	6,244,422	6,569,924	(325,502)	6,244,422	5,165,797	1,078,625	(1,404,127)	(742,746)	1.97E+12	1.04E+12
1993	2,933,875	1,126	69,764,866	-	4,040,940	(1,107,065)	6,290,520	6,997,933	(707,413)	6,290,520	5,183,455	1,107,065	(1,814,478)	(1,404,127)	3.29E+12	2.55E+12
1994	3,636,846	1,126	68,199,635	-	3,896,436	(259,590)	6,153,706	6,998,528	(844,822)	6,153,706	5,894,116	259,590	(1,104,412)	(1,814,478)	1.22E+12	2.00E+12
1995	4,828,283	1,127	70,398,699	-	3,856,884	971,399	6,423,630	6,946,723	(523,094)	6,423,630	7,395,029	(971,399)	448,305	(1,104,412)	2.01E+11	-4.95E+11
1996	4,850,781	1,127	72,179,662	-	3,805,674	1,045,107	7,026,031	6,857,246	168,785	7,026,031	8,071,139	(1,045,107)	1,213,892	448,305	1.47E+12	5.44E+11
1997	3,569,955	1,128	73,623,127	-	3,745,055	(175,100)	7,259,842	6,739,374	520,467	7,259,842	7,084,742	175,100	345,368	1,213,892	1.19E+11	4.19E+11
1998	3,660,679	1,128	76,238,462	-	3,717,108	(56,430)	6,802,343	6,650,768	151,575	6,802,343	6,745,913	56,430	95,145	345,368	9.05E+09	3.29E+10
1999	4,524,404	1,129	77,986,017	-	3,664,967	859,437	6,602,650	6,544,078	58,572	6,602,650	7,462,087	(859,437)	918,009	95,145	8.43E+11	8.73E+10
2000	4,153,978	1,129	79,356,950	-	3,602,326	551,652	6,851,886	6,416,134	435,752	6,851,886	7,403,537	(551,652)	987,404	918,009	9.75E+11	9.06E+11
2001	3,255,638	1,130	80,818,372	-	3,542,207	(286,570)	6,766,270	6,282,148	484,122	6,766,270	6,479,700	286,570	197,553	987,404	3.90E+10	1.95E+11
2002	2,611,737	1,131	82,383,282	-	3,484,974	(873,237)	6,306,728	6,149,208	157,520	6,306,728	5,433,491	873,237	(715,717)	197,553	5.12E+11	-1.41E+11
2003	3,861,237	1,131	83,329,300	-	3,410,486	450,752	5,776,641	5,994,736	(218,096)	5,776,641	6,227,392	(450,752)	232,656	(715,717)	5.41E+10	-1.67E+11
2004	3,573,729	1,132	85,464,530	-	3,369,153	204,576	6,081,033	5,873,136	207,897	6,081,033	6,285,609	(204,576)	412,473	232,656	1.70E+11	9.60E+10
												SUM	(230,319)	(412,473)	1.77E+13	7.73E+12

ORIGINAL REGRESSION D-W
SLOPE 0.438327665

INTERCEPT -1768.579202

DURBIN-WATSON 1.12
R-SQUARED 0.126

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
230,319				##########	
1.53E+06	2.30E+05	1.29E+06	1.68E+12	2.33E+12	3.51E+11
8.47E+05	1.53E+06	-6.79E+05	4.61E+11	7.17E+11	1.29E+12
-7.56E+05	8.47E+05	-1.60E+06	2.57E+12	5.71E+11	-6.40E+11
1.18E+05	-7.56E+05	8.73E+05	7.62E+11	1.38E+10	-8.89E+10
2.41E+05	1.18E+05	1.24E+05	1.53E+10	5.83E+10	2.84E+10
9.78E+04	2.41E+05	-1.44E+05	2.06E+10	9.56E+09	2.36E+10
-9.36E+05	9.78E+04	-1.03E+06	1.07E+12	8.75E+11	-9.15E+10
-6.71E+05	-9.36E+05	2.65E+05	7.01E+10	4.50E+11	6.28E+11
8.94E+05	-6.71E+05	1.56E+06	2.45E+12	7.99E+11	-6.00E+11
-4.44E+05	8.94E+05	-1.34E+06	1.79E+12	1.97E+11	-3.97E+11
-5.04E+05	-4.44E+05	-6.02E+04	3.63E+09	2.54E+11	2.24E+11
8.71E+03	-5.04E+05	5.13E+05	2.63E+11	7.59E+07	-4.39E+09
1.55E+05	8.71E+03	1.46E+05	2.13E+10	2.39E+10	1.35E+09
1.24E+05	1.55E+05	-3.02E+04	9.14E+08	1.55E+10	1.92E+10
-7.43E+05	1.24E+05	-8.67E+05	7.52E+11	5.52E+11	-9.24E+10
-1.40E+06	-7.43E+05	-6.61E+05	4.37E+11	1.97E+12	1.04E+12
-1.81E+06	-1.40E+06	-4.10E+05	1.68E+11	3.29E+12	2.55E+12
-1.10E+06	-1.81E+06	7.10E+05	5.04E+11	1.22E+12	2.00E+12
4.48E+05	-1.10E+06	1.55E+06	2.41E+12	2.01E+11	-4.95E+11
1.21E+06	4.48E+05	7.66E+05	5.86E+11	1.47E+12	5.44E+11
3.45E+05	1.21E+06	-8.59E+05	7.54E+11	1.19E+11	4.19E+11
9.51E+04	3.45E+05	-2.50E+05	6.26E+10	9.05E+09	3.29E+10
9.18E+05	9.51E+04	8.23E+05	6.77E+11	8.43E+11	8.73E+10
9.87E+05	9.18E+05	6.94E+04	4.82E+09	9.75E+11	9.06E+11
1.98E+05	9.87E+05	-7.90E+05	6.24E+11	3.90E+10	1.95E+11
-7.16E+05	1.98E+05	-9.13E+05	8.34E+11	5.12E+11	-1.41E+11
2.33E+05	-7.16E+05	9.48E+05	8.99E+11	5.41E+10	-1.67E+11
4.12E+05	2.33E+05	1.80E+05	3.23E+10	1.70E+11	9.60E+10
-2.30E+05	-4.12E+05	1.82E+05	1.99E+13	1.78E+13	7.73E+12

TRANSFORMED REGRESSION D-W
SLOPE 0.13639578

INTERCEPT -54127.14103

DURBIN-WATSON 1.57
R-SQUARED

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
1.49E+06				2.22E+12	
2.37E+05	1.49E+06	-1.25E+06	1.57E+12	5.62E+10	3.53E+11
-1.07E+06	2.37E+05	-1.31E+06	1.71E+12	1.15E+12	-2.54E+11
4.77E+05	-1.07E+06	1.55E+06	2.40E+12	2.28E+11	-5.12E+11
2.03E+05	4.77E+05	-2.75E+05	7.55E+10	4.11E+10	9.68E+10
1.73E+03	2.03E+05	-2.01E+05	4.04E+10	2.99E+06	3.50E+08
-1.00E+06	1.73E+03	-1.00E+06	1.00E+12	1.00E+12	-1.73E+09
-2.92E+05	-1.00E+06	7.08E+05	5.02E+11	8.54E+10	2.92E+11
1.17E+06	-2.92E+05	1.46E+06	2.13E+12	1.36E+12	-3.41E+11
-8.42E+05	1.17E+06	-2.01E+06	4.04E+12	7.10E+11	-9.84E+11
-2.95E+05	-8.42E+05	5.47E+05	2.99E+11	8.72E+10	2.49E+11
2.41E+05	-2.95E+05	5.37E+05	2.88E+11	5.83E+10	-7.13E+10
1.55E+05	2.41E+05	-8.67E+04	7.52E+09	2.39E+10	3.73E+10
6.62E+04	1.55E+05	-8.85E+04	7.83E+09	4.39E+09	1.02E+10
-7.83E+05	6.62E+04	-8.49E+05	7.20E+11	6.12E+11	-5.18E+10
-1.08E+06	-7.83E+05	-2.96E+05	8.76E+10	1.16E+12	8.44E+11
-1.11E+06	-1.08E+06	-2.84E+04	8.09E+08	1.23E+12	1.19E+12
-2.60E+05	-1.11E+06	8.47E+05	7.18E+11	6.74E+10	2.87E+11
9.71E+05	-2.60E+05	1.23E+06	1.52E+12	9.44E+11	-2.52E+11
1.05E+06	9.71E+05	7.37E+04	5.43E+09	1.09E+12	1.02E+12
-1.75E+05	1.05E+06	-1.22E+06	1.49E+12	3.07E+10	-1.83E+11
-5.64E+04	-1.75E+05	1.19E+05	1.41E+10	3.18E+09	9.88E+09
8.59E+05	-5.64E+04	9.16E+05	8.39E+11	7.39E+11	-4.85E+10
5.52E+05	8.59E+05	-3.08E+05	9.47E+10	3.04E+11	4.74E+11
-2.87E+05	5.52E+05	-8.38E+05	7.03E+11	8.21E+10	-1.58E+11
-8.73E+05	-2.87E+05	-5.87E+05	3.44E+11	7.63E+11	2.50E+11
4.51E+05	-8.73E+05	1.32E+06	1.75E+12	2.03E+11	-3.94E+11
2.05E+05	4.51E+05	-2.46E+05	6.06E+10	4.19E+10	9.22E+10
-7.34E-07	-2.05E+05	-1.28E+06	2.24E+13	1.43E+13	1.96E+12

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2D Distribution Capacity-Related Expenses - Ln(Year) and Ln(Plt Investment)

R SQUARED, ADJUSTED =	0.04	
DURBIN WATSON STATISTIC =	1.12	
	Before Cochrane Orcott Adjustment	
DPETC = Distr Expense Total Cost	X-VARIABLE COEFF.	t STATISTIC
CONSTANT	160913485	0.501
LN(YEAR) = Ln(Year)	(20,281,474)	-0.479
LN(DTI) = Ln Distr Plant Invest	-1710193.39%	-0.6828

Line Estimate Results

-1.71E+04	(20,281,474)	1.61E+08	#N/A
2.50E+04	42,333,455	3.21E+08	#N/A
0.044118	865,047	#N/A	#N/A
0.6000	26	#N/A	#N/A
8.98E+11	1.95E+13	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR	DPETC	LN(YEAR)	LN(DTI)

YEAR	DISTR EXPENSE TOTAL COST	LN(YEAR)	LN DISTR PLANT INVEST	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	$7,266,430	7.59	(21)	7355239	-88809	7266430
1977	$8,482,448	7.59	15.27	6729467	1752981	8482448
1978	$7,730,844	7.59	15.98	6707026	1023819	7730844
1979	$6,092,196	7.59	16.47	6688449	-596253	6092196
1980	$6,854,979	7.59	16.68	6674541	180438	6854979
1981	$6,852,095	7.59	16.84	6661664	190432	6852095
1982	$6,643,007	7.59	17.04	6647930	-4922	6643007
1983	$5,440,661	7.59	17.11	6636559	-1195898	5440661
1984	$5,608,312	7.59	17.24	6624095	-1015782	5608312
1985	$7,185,645	7.59	17.44	6610423	575222	7185645
1986	$5,901,049	7.59	17.63	6596904	-695855	5901049
1987	$5,985,548	7.59	17.84	6583121	-597573	5985548
1988	$6,556,706	7.59	17.98	6570597	-13891	6556706
1989	$6,690,804	7.60	18.07	6558830	131974	6690804
1990	$6,686,164	7.60	18.17	6546966	139197	6686164
1991	$5,860,228	7.60	18.26	6535167	-674939	5860228
1992	$5,165,797	7.60	18.32	6523902	-1358105	5165797
1993	$5,183,455	7.60	18.51	6510544	-1327088	5183455
1994	$5,894,116	7.60	18.57	6499380	-605264	5894116
1995	$7,395,029	7.60	18.61	6488484	906545	7395029
1996	$8,071,139	7.60	18.64	6477767	1593371	8071139
1997	$7,084,742	7.60	18.67	6467179	617563	7084742
1998	$6,745,913	7.60	18.70	6456500	289414	6745913
1999	$7,462,087	7.60	18.72	6445905	1016182	7462087
2000	$7,403,537	7.60	18.75	6435401	968137	7403537
2001	$6,479,700	7.60	18.76	6424930	54771	6479700
2002	$5,433,491	7.60	18.78	6414466	-980975	5433491
2003	$6,227,392	7.60	18.80	6404085	-176693	6227392
2004	$6,285,609	7.60	18.82	6393607	-107998	6285609

REGRESSION MODEL NO. 2D Distribution Capacity-Related Expenses - Ln(Year) and Ln(Plt Investment) WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED =	0.19
DURBIN WATSON STATISTIC =	1.77

After Cochrane Orcott Adjustment

X-VARIABLE COEFF.	t STATISTIC
-22444108	-0.090
5,850,128	0.099
11963186.75%	2.413

Line Estimate Results

1.20E+05	5,850,128	-2.24E+07	#N/A
4.96E+04	58,814,380	2.50E+08	#N/A
0.192195	692,855	#N/A	#N/A
2.9740	25	#N/A	#N/A
2.86E+12	1.20E+13	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

		TRANSFORMED VARIABLES												RHO	0.44156		
YEAR	Y TOTAL COST	X1 LN(YEAR)	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE		ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
1976														(88,809)			
1977	5,273,862	4	24	-	5,272,191	1,671	8,480,777	6,729,467	1,751,310	8,480,777.4	8,482,448.1	(1,670.7)		1,752,981	(88,809)	3.07E+12	-1.56E+11
1978	3,985,309	4	9	-	3,457,874	527,436	7,203,409	6,707,026	496,383	7,203,408.5	7,730,844.4	(527,435.9)		1,023,819	1,752,981	1.05E+12	1.79E+12
1979	2,678,541	4	9	-	3,480,126	(801,584)	6,893,780	6,688,449	205,331	6,893,780.2	6,092,195.9	801,584.3		(596,253)	1,023,819	3.56E+11	-6.10E+11
1980	4,164,891	4	9	-	3,481,677	683,214	6,171,765	6,674,541	(502,776)	6,171,764.9	6,854,979.2	(683,214.4)		180,438	(596,253)	3.26E+10	-1.08E+11
1981	3,825,190	4	9	-	3,490,459	334,731	6,517,364	6,661,664	(144,300)	6,517,363.9	6,852,095.2	(334,731.3)		190,432	180,438	3.63E+10	3.44E+10
1982	3,617,376	4	10	-	3,508,435	108,941	6,534,066	6,647,930	(113,864)	6,534,066.1	6,643,007.4	(108,941.4)		(4,922)	190,432	2.42E+07	-9.37E+08
1983	2,507,355	4	10	-	3,507,252	(999,897)	6,440,558	6,636,559	(196,001)	6,440,558.3	5,440,661.2	999,897.1		(1,195,898)	(4,922)	1.43E+12	5.89E+09
1984	3,205,918	4	10	-	3,521,042	(315,124)	5,923,437	6,624,095	(700,658)	5,923,437	5,608,312	315,124		(1,015,782)	(1,195,898)	1.03E+12	1.21E+12
1985	4,709,222	4	10	-	3,539,916	1,169,305	6,016,340	6,610,423	(594,083)	6,016,340	7,185,645	(1,169,305)		575,222	(1,015,782)	3.31E+11	-5.84E+11
1986	2,728,135	4	10	-	3,554,010	(825,875)	6,726,925	6,596,904	130,021	6,726,925	5,901,049	825,875		(695,855)	575,222	4.84E+11	-4.00E+11
1987	3,379,863	4	10	-	3,570,449	(190,586)	6,176,134	6,583,121	(406,986)	6,176,134	5,985,548	190,586		(597,573)	(695,855)	3.57E+11	4.16E+11
1988	3,913,710	4	10	-	3,577,274	336,436	6,220,271	6,570,597	(350,327)	6,220,271	6,556,706	(336,436)		(13,891)	(597,573)	1.93E+08	8.30E+09
1989	3,795,606	4	10	-	3,582,721	212,885	6,477,920	6,558,830	(80,911)	6,477,920	6,690,804	(212,885)		131,974	(13,891)	1.74E+10	-1.83E+09
1990	3,731,752	4	10	-	3,591,200	140,552	6,545,612	6,546,966	(1,355)	6,545,612	6,686,164	(140,552)		139,197	131,974	1.94E+10	1.84E+10
1991	2,907,866	4	10	-	3,598,942	(691,076)	6,551,304	6,535,167	16,137	6,551,304	5,860,228	691,076		(674,939)	139,197	4.56E+11	-9.39E+10
1992	2,578,137	4	10	-	3,603,176	(1,025,039)	6,190,836	6,523,902	(333,066)	6,190,836	5,165,797	1,025,039		(1,358,105)	(674,939)	1.84E+12	9.17E+11
1993	2,902,431	4	10	-	3,623,715	(721,284)	5,904,739	6,510,544	(605,804)	5,904,739	5,183,455	721,284		(1,327,088)	(1,358,105)	1.76E+12	1.80E+12
1994	3,605,294	4	10	-	3,622,453	(17,159)	5,911,275	6,499,380	(588,106)	5,911,275	5,894,116	17,159		(605,264)	(1,327,088)	3.66E+11	8.03E+11
1995	4,792,405	4	10	-	3,626,125	1,166,280	6,228,748	6,488,484	(259,736)	6,228,748	7,395,029	(1,166,280)		906,545	(605,264)	8.22E+11	-5.49E+11
1996	4,805,768	4	10	-	3,629,384	1,176,384	6,894,755	6,477,767	416,988	6,894,755	8,071,139	(1,176,384)		1,593,371	906,545	2.54E+12	1.44E+12
1997	3,520,826	4	10	-	3,632,315	(111,489)	7,196,231	6,467,179	729,052	7,196,231	7,084,742	111,489		617,563	1,593,371	3.81E+11	9.84E+11
1998	3,617,554	4	10	-	3,636,303	(18,749)	6,764,663	6,456,500	308,163	6,764,663	6,745,913	18,749		289,414	617,563	8.38E+10	1.79E+11
1999	4,483,342	4	10	-	3,639,433	843,908	6,618,179	6,445,905	172,274	6,618,179	7,462,087	(843,908)		1,016,182	289,414	1.03E+12	2.94E+11
2000	4,108,556	4	10	-	3,642,214	466,342	6,937,195	6,435,401	501,794	6,937,195	7,403,537	(466,342)		968,137	1,016,182	9.37E+11	9.84E+11
2001	3,210,573	4	10	-	3,645,060	(434,488)	6,914,188	6,424,930	489,259	6,914,188	6,479,700	434,488		54,771	968,137	3.00E+09	5.30E+10
2002	2,572,295	4	10	-	3,647,973	(1,075,677)	6,509,168	6,414,466	94,702	6,509,168	5,433,491	1,075,677		(980,975)	54,771	9.62E+11	-5.37E+10
2003	3,828,164	4	11	-	3,650,354	177,810	6,049,582	6,404,085	(354,503)	6,049,582	6,227,392	(177,810)		(176,693)	(980,975)	3.12E+10	1.73E+11
2004	3,535,823	4	11	-	3,653,691	(117,868)	6,403,477	6,393,607	9,870	6,403,477	6,285,609	117,868		(107,998)	(176,693)	1.17E+10	1.91E+10
													SUM	88,809	107,998	1.94E+13	8.59E+12

ORIGINAL REGRESSION D-W
SLOPE 0.441640573

INTERCEPT 1468.302375

DURBIN-WATSON 1.12
R-SQUARED 0.044

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
(88,809)				#########	
1.75E+06	-8.88E+04	1.84E+06	3.39E+12	3.07E+12	-1.56E+11
1.02E+06	1.75E+06	-7.29E+05	5.32E+11	1.05E+12	1.79E+12
-5.96E+05	1.02E+06	-1.62E+06	2.62E+12	3.56E+11	-6.10E+11
1.80E+05	-5.96E+05	7.77E+05	6.03E+11	3.26E+10	-1.08E+11
1.90E+05	1.80E+05	9.99E+03	9.99E+07	3.63E+10	3.44E+10
-4.92E+03	1.90E+05	-1.95E+05	3.82E+10	2.42E+07	-9.37E+08
-1.20E+06	-4.92E+03	-1.19E+06	1.42E+12	1.43E+12	5.89E+09
-1.02E+06	-1.20E+06	1.80E+05	3.24E+10	1.03E+12	1.21E+12
5.75E+05	-1.02E+06	1.59E+06	2.53E+12	3.31E+11	-5.84E+11
-6.96E+05	5.75E+05	-1.27E+06	1.62E+12	4.84E+11	-4.00E+11
-5.98E+05	-6.96E+05	9.83E+04	9.66E+09	3.57E+11	4.16E+11
-1.39E+04	-5.98E+05	5.84E+05	3.41E+11	1.93E+08	8.30E+09
1.32E+05	-1.39E+04	1.46E+05	2.13E+10	1.74E+10	-1.83E+09
1.39E+05	1.32E+05	7.22E+03	5.22E+07	1.94E+10	1.84E+10
-6.75E+05	1.39E+05	-8.14E+05	6.63E+11	4.56E+11	-9.39E+10
-1.36E+06	-6.75E+05	-6.83E+05	4.67E+11	1.84E+12	9.17E+11
-1.33E+06	-1.36E+06	3.10E+04	9.62E+08	1.76E+12	1.80E+12
-6.05E+05	-1.33E+06	7.22E+05	5.21E+11	3.66E+11	8.03E+11
9.07E+05	-6.05E+05	1.51E+06	2.29E+12	8.22E+11	-5.49E+11
1.59E+06	9.07E+05	6.87E+05	4.72E+11	2.54E+12	1.44E+12
6.18E+05	1.59E+06	-9.76E+05	9.52E+11	3.81E+11	9.84E+11
2.89E+05	6.18E+05	-3.28E+05	1.08E+11	8.36E+10	1.79E+11
1.02E+06	2.89E+05	7.27E+05	5.28E+11	1.03E+12	2.94E+11
9.68E+05	1.02E+06	-4.80E+04	2.31E+09	9.37E+11	9.84E+11
5.48E+04	9.68E+05	-9.13E+05	8.34E+11	3.00E+09	5.30E+10
-9.81E+05	5.48E+04	-1.04E+06	1.07E+12	9.62E+11	-5.37E+10
-1.77E+05	-9.81E+05	8.04E+05	6.47E+11	3.12E+10	1.73E+11
-1.08E+05	-1.77E+05	6.87E+04	4.72E+09	1.17E+10	1.91E+10
8.88E+04	1.08E+05	-1.92E+04	2.17E+13	1.95E+13	8.59E+12

TRANSFORMED REGRESSION D-W
SLOPE 0.11500648

INTERCEPT -563.935479

DURBIN-WATSON 1.77
R-SQUARED

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
1.67E+03				2.79E+06	
5.27E+05	1.67E+03	5.26E+05	2.76E+11	2.78E+11	8.81E+08
-8.02E+05	5.27E+05	-1.33E+06	1.77E+12	6.43E+11	-4.23E+11
6.83E+05	-8.02E+05	1.48E+06	2.20E+12	4.67E+11	-5.48E+11
3.35E+05	6.83E+05	-3.48E+05	1.21E+11	1.12E+11	2.29E+11
1.09E+05	3.35E+05	-2.26E+05	5.10E+10	1.19E+10	3.65E+10
-1.00E+06	1.09E+05	-1.11E+06	1.23E+12	1.00E+12	-1.09E+11
-3.15E+05	-1.00E+06	6.85E+05	4.69E+11	9.93E+10	3.15E+11
1.17E+06	-3.15E+05	1.48E+06	2.20E+12	1.37E+12	-3.68E+11
-8.26E+05	1.17E+06	-2.00E+06	3.98E+12	6.82E+11	-9.66E+11
-1.91E+05	-8.26E+05	6.35E+05	4.04E+11	3.63E+10	1.57E+11
3.36E+05	-1.91E+05	5.27E+05	2.78E+11	1.13E+11	-6.41E+10
2.13E+05	3.36E+05	-1.24E+05	1.53E+10	4.53E+10	7.16E+10
1.41E+05	2.13E+05	-7.23E+04	5.23E+09	1.98E+10	2.99E+10
-6.91E+05	1.41E+05	-8.32E+05	6.92E+11	4.78E+11	-9.71E+10
-1.03E+06	-6.91E+05	-3.34E+05	1.12E+11	1.05E+12	7.08E+11
-7.21E+05	-1.03E+06	3.04E+05	9.23E+10	5.20E+11	7.39E+11
-1.72E+04	-7.21E+05	7.04E+05	4.96E+11	2.94E+08	1.24E+10
1.17E+06	-1.72E+04	1.18E+06	1.40E+12	1.36E+12	-2.00E+10
1.18E+06	1.17E+06	1.01E+04	1.02E+08	1.38E+12	1.37E+12
-1.11E+05	1.18E+06	-1.29E+06	1.66E+12	1.24E+10	-1.31E+11
-1.87E+04	-1.11E+05	9.27E+04	8.60E+09	3.52E+08	2.09E+09
8.44E+05	-1.87E+04	8.63E+05	7.44E+11	7.12E+11	-1.58E+10
4.66E+05	8.44E+05	-3.78E+05	1.43E+11	2.17E+11	3.94E+11
-4.34E+05	4.66E+05	-9.01E+05	8.11E+11	1.89E+11	-2.03E+11
-1.08E+06	-4.34E+05	-6.41E+05	4.11E+11	1.16E+12	4.67E+11
1.78E+05	-1.08E+06	1.25E+06	1.57E+12	3.16E+10	-1.91E+11
-1.18E+05	1.78E+05	-2.96E+05	8.74E+10	1.39E+10	-2.10E+10
7.73E-08	1.18E+05	-1.20E+05	2.12E+13	1.20E+13	1.38E+12

BAY STATE GAS COMPANY
MARGINAL COST STUDY REGRESSIONS
COCHRANE ORCOTT ADJUSTMENT WORKPAPERS

REGRESSION MODEL NO. 2E - Ln Distribution Capacity-Related Expenses - Ln(Year) and Ln(Plt Investment)

R SQUARED, ADJUSTED =		0.04	
DURBIN WATSON STATISTIC =		1.10	
		Before Cochrane Orcott Adjustment	
DPETC =	Distr Expense Total Cost	X-VARIABLE COEFF.	t STATISTIC
CONSTANT		37	0.748
LN(YEAR) =	Ln(Year)	(3)	-0.426
LN(DTI) =	Ln Distr Plant Invest	-0.27%	-0.7137

Line Estimate Results

-2.72E-03	(3)	3.66E+01	#N/A
3.82E-03	6	4.90E+01	#N/A
0.043055	0	#N/A	#N/A
0.5849	26	#N/A	#N/A
2.03E-02	4.52E-01	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

YEAR DPETC LN(YEAR) LN(DTI)

YEAR	DISTR EXPENSE TOTAL COST	LN(YEAR)	LN DISTR PLANT INVEST	ESTIMATED (Y)'	RESIDUAL	ESTIMATED + RESIDUAL (Y)
1976	15.80	7.59	(21)	15.81	(0.01)	15.80
1977	15.95	7.59	15.27	15.71	0.24	15.95
1978	15.86	7.59	15.98	15.71	0.15	15.86
1979	15.62	7.59	16.47	15.71	(0.08)	15.62
1980	15.74	7.59	16.68	15.70	0.04	15.74
1981	15.74	7.59	16.84	15.70	0.04	15.74
1982	15.71	7.59	17.04	15.70	0.01	15.71
1983	15.51	7.59	17.11	15.70	(0.19)	15.51
1984	15.54	7.59	17.24	15.70	(0.16)	15.54
1985	15.79	7.59	17.44	15.70	0.09	15.79
1986	15.59	7.59	17.63	15.69	(0.10)	15.59
1987	15.60	7.59	17.84	15.69	(0.09)	15.60
1988	15.70	7.59	17.98	15.69	0.01	15.70
1989	15.72	7.60	18.07	15.69	0.03	15.72
1990	15.72	7.60	18.17	15.69	0.03	15.72
1991	15.58	7.60	18.26	15.68	(0.10)	15.58
1992	15.46	7.60	18.32	15.68	(0.23)	15.46
1993	15.46	7.60	18.51	15.68	(0.22)	15.46
1994	15.59	7.60	18.57	15.68	(0.09)	15.59
1995	15.82	7.60	18.61	15.68	0.14	15.82
1996	15.90	7.60	18.64	15.68	0.23	15.90
1997	15.77	7.60	18.67	15.68	0.10	15.77
1998	15.72	7.60	18.70	15.67	0.05	15.72
1999	15.83	7.60	18.72	15.67	0.15	15.83
2000	15.82	7.60	18.75	15.67	0.15	15.82
2001	15.68	7.60	18.76	15.67	0.01	15.68
2002	15.51	7.60	18.78	15.67	(0.16)	15.51
2003	15.64	7.60	18.80	15.67	(0.02)	15.64
2004	15.65	7.60	18.82	15.67	(0.01)	15.65

REGRESSION MODEL NO. 2E - Ln Distribution Capacity-Related Expenses - Ln(Year) and Ln(Plt Investment) WITH COCHRANE ORCOTT ADJUSTMENT

R SQUARED, ADJUSTED = 0.15
DURBIN WATSON STATISTIC = 1.76
After Cochrane Orcott Adjustment
X-VARIABLE COEFF. t STATISTIC

4	0.109
1	0.109
1.58%	2.079

Line Estimate Results

1.58E-02	1	4.25E+00	#N/A
7.62E-03	9	3.90E+01	#N/A
0.149815	0	#N/A	#N/A
2.2027	25	#N/A	#N/A
5.14E-02	2.92E-01	#N/A	#N/A

Format of Line Estimate Results

Slope	Constant
Std Err X	Std Err b
R^2	Std Err Y
F	Deg of Free
SumSq Reg	SumSq Resid

RHO 0.44763

YEAR	Y TOTAL COST	TRANSFORMED VARIABLES X1 LN(YEAR)	X2 N/A	X3 N/A	ESTIMATED (Y)'t	RESIDUAL	ADJUSTED FORECAST (Y)	ORIGINAL FORECAST (Y)'	DIFFERENCE	ADJUSTED FORECAST (Y)	ORIGINAL ESTIMATED + RESIDUAL (Y)	DIFFERENCE	ERROR	LAGGED ERROR	ERROR^2	E(t)*E(t-1)
													(0)			
1976																
1977	8.88	4.19	24.54	-	8.88	0.00	15.95	15.71	0.24	15.95	15.95	(0.00)	0.24	(0.01)	0.06	(0.00)
1978	8.72	4.19	9.15	-	8.64	0.08	15.78	15.71	0.07	15.78	15.86	(0.08)	0.15	0.24	0.02	0.04
1979	8.52	4.19	9.31	-	8.64	(0.12)	15.74	15.71	0.03	15.74	15.62	0.12	(0.08)	0.15	0.01	(0.01)
1980	8.75	4.19	9.31	-	8.64	0.11	15.63	15.70	(0.07)	15.63	15.74	(0.11)	0.04	(0.08)	0.00	(0.00)
1981	8.69	4.19	9.37	-	8.64	0.05	15.69	15.70	(0.01)	15.69	15.74	(0.05)	0.04	0.04	0.00	0.00
1982	8.66	4.19	9.50	-	8.64	0.02	15.69	15.70	(0.01)	15.69	15.71	(0.02)	0.01	0.04	0.00	0.00
1983	8.48	4.19	9.48	-	8.64	(0.17)	15.68	15.70	(0.02)	15.68	15.51	0.17	(0.19)	0.01	0.04	(0.00)
1984	8.60	4.19	9.58	-	8.65	(0.05)	15.59	15.70	(0.11)	15.59	15.54	0.05	(0.16)	(0.19)	0.02	0.03
1985	8.83	4.19	9.72	-	8.65	0.18	15.60	15.70	(0.09)	15.60	15.79	(0.18)	0.09	(0.16)	0.01	(0.01)
1986	8.52	4.19	9.83	-	8.65	(0.13)	15.72	15.69	0.02	15.72	15.59	0.13	(0.10)	0.09	0.01	(0.01)
1987	8.63	4.20	9.95	-	8.65	(0.03)	15.63	15.69	(0.06)	15.63	15.60	0.03	(0.09)	(0.10)	0.01	0.01
1988	8.71	4.20	9.99	-	8.65	0.06	15.64	15.69	(0.05)	15.64	15.70	(0.06)	0.01	(0.09)	0.00	(0.00)
1989	8.69	4.20	10.02	-	8.65	0.04	15.68	15.69	(0.01)	15.68	15.72	(0.04)	0.03	0.01	0.00	0.00
1990	8.68	4.20	10.08	-	8.66	0.02	15.69	15.69	0.00	15.69	15.72	(0.02)	0.03	0.03	0.00	0.00
1991	8.55	4.20	10.13	-	8.66	(0.11)	15.69	15.68	0.01	15.69	15.58	0.11	(0.10)	0.03	0.01	(0.00)
1992	8.48	4.20	10.15	-	8.66	(0.18)	15.63	15.68	(0.05)	15.63	15.46	0.18	(0.23)	(0.10)	0.05	0.02
1993	8.54	4.20	10.31	-	8.66	(0.12)	15.58	15.68	(0.10)	15.58	15.46	0.12	(0.22)	(0.23)	0.05	0.05
1994	8.67	4.20	10.28	-	8.66	0.01	15.58	15.68	(0.10)	15.58	15.59	(0.01)	(0.09)	(0.22)	0.01	0.02
1995	8.84	4.20	10.30	-	8.66	0.18	15.64	15.68	(0.04)	15.64	15.82	(0.18)	0.14	(0.09)	0.02	(0.01)
1996	8.82	4.20	10.31	-	8.66	0.16	15.74	15.68	0.06	15.74	15.90	(0.16)	0.23	0.14	0.05	0.03
1997	8.65	4.20	10.32	-	8.66	(0.01)	15.78	15.68	0.11	15.78	15.77	0.01	0.10	0.23	0.01	0.02
1998	8.66	4.20	10.34	-	8.66	0.00	15.72	15.67	0.05	15.72	15.72	(0.00)	0.05	0.10	0.00	0.00
1999	8.79	4.20	10.35	-	8.66	0.12	15.70	15.67	0.03	15.70	15.83	(0.12)	0.15	0.05	0.02	0.01
2000	8.73	4.20	10.36	-	8.66	0.07	15.75	15.67	0.08	15.75	15.82	(0.07)	0.15	0.15	0.02	0.02
2001	8.60	4.20	10.37	-	8.66	(0.06)	15.74	15.67	0.07	15.74	15.68	0.06	0.01	0.15	0.00	0.00
2002	8.49	4.20	10.38	-	8.66	(0.18)	15.68	15.67	0.02	15.68	15.51	0.18	(0.16)	0.01	0.03	(0.00)
2003	8.70	4.20	10.39	-	8.66	0.04	15.61	15.67	(0.06)	15.61	15.64	(0.04)	(0.02)	(0.16)	0.00	0.00
2004	8.65	4.20	10.40	-	8.66	(0.01)	15.67	15.67	0.00	15.67	15.65	0.01	(0.01)	(0.02)	0.00	0.00
												SUI	0.01	0.01	0.45	0.20

ORIGINAL REGRESSION D-W

SLOPE	0.447592227
INTERCEPT	0.000275348
DURBIN-WATSON	1.10
R-SQUARED	0.043

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
(0)				0	
0.24	(0.01)	0.25	0.06	0.06	(0.00)
0.15	0.24	(0.09)	0.01	0.02	0.04
(0.08)	0.15	(0.24)	0.06	0.01	(0.01)
0.04	(0.08)	0.12	0.01	0.00	(0.00)
0.04	0.04	0.00	0.00	0.00	0.00
0.01	0.04	(0.03)	0.00	0.00	0.00
(0.19)	0.01	(0.20)	0.04	0.04	(0.00)
(0.16)	(0.19)	0.03	0.00	0.02	0.03
0.09	(0.16)	0.25	0.06	0.01	(0.01)
(0.10)	0.09	(0.20)	0.04	0.01	(0.01)
(0.09)	(0.10)	0.02	0.00	0.01	0.01
0.01	(0.09)	0.09	0.01	0.00	(0.00)
0.03	0.01	0.02	0.00	0.00	0.00
0.03	0.03	0.00	0.00	0.00	0.00
(0.10)	0.03	(0.13)	0.02	0.01	(0.00)
(0.23)	(0.10)	(0.12)	0.02	0.05	0.02
(0.22)	(0.23)	0.01	0.00	0.05	0.05
(0.09)	(0.22)	0.13	0.02	0.01	0.02
0.14	(0.09)	0.23	0.05	0.02	(0.01)
0.23	0.14	0.09	0.01	0.05	0.03
0.10	0.23	(0.13)	0.02	0.01	0.02
0.05	0.10	(0.05)	0.00	0.00	0.00
0.15	0.05	0.10	0.01	0.02	0.01
0.15	0.15	(0.01)	0.00	0.02	0.02
0.01	0.15	(0.13)	0.02	0.00	0.00
(0.16)	0.01	(0.17)	0.03	0.03	(0.00)
(0.02)	(0.16)	0.14	0.02	0.00	0.00
(0.01)	(0.02)	0.01	0.00	0.00	0.00
0.01	0.01	0.00	0.50	0.45	0.20

TRANSFORMED REGRESSION D-W

SLOPE	0.12095697
INTERCEPT	-7.78763E-05
DURBIN-WATSON	1.76
R-SQUARED	

ERROR	LAGGED ERROR	E(t) - E(t-1)	DELTA ERROR^2	ERROR^2	E(t)*E(t-1)
0.00				0.00	
0.08	0.00	0.08	0.01	0.01	0.00
(0.12)	0.08	(0.20)	0.04	0.01	(0.01)
0.11	(0.12)	0.22	0.05	0.01	(0.01)
0.05	0.11	(0.05)	0.00	0.00	0.01
0.02	0.05	(0.03)	0.00	0.00	0.00
(0.17)	0.02	(0.19)	0.03	0.03	(0.00)
(0.05)	(0.17)	0.12	0.01	0.00	0.01
0.18	(0.05)	0.23	0.05	0.03	(0.01)
(0.13)	0.18	(0.31)	0.10	0.02	(0.02)
(0.03)	(0.13)	0.10	0.01	0.00	0.00
0.06	(0.03)	0.08	0.01	0.00	(0.00)
0.04	0.06	(0.02)	0.00	0.00	0.00
0.02	0.04	(0.01)	0.00	0.00	0.00
(0.11)	0.02	(0.13)	0.02	0.01	(0.00)
(0.18)	(0.11)	(0.07)	0.00	0.03	0.02
(0.12)	(0.18)	0.06	0.00	0.01	0.02
0.01	(0.12)	0.13	0.02	0.00	(0.00)
0.18	0.01	0.17	0.03	0.03	0.00
0.16	0.18	(0.01)	0.00	0.03	0.03
(0.01)	0.16	(0.17)	0.03	0.00	(0.00)
0.00	(0.01)	0.01	0.00	0.00	(0.00)
0.12	0.00	0.12	0.01	0.02	0.00
0.07	0.12	(0.05)	0.00	0.00	0.01
(0.06)	0.07	(0.13)	0.02	0.00	(0.00)
(0.18)	(0.06)	(0.12)	0.01	0.03	0.01
0.04	(0.18)	0.21	0.05	0.00	(0.01)
(0.01)	0.04	(0.05)	0.00	0.00	(0.00)
(0.00)	0.01	(0.01)	0.51	0.29	0.04

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-4 Regarding the Company's marginal cost study (see Exh. BSG/JLH-3). Please discuss whether the method of estimating the marginal customer-related operating expenses complies with the Department's directives set in Fitchburg Gas and Electric Light Company, D.T.E. 02-24/25 (2002) and Boston Gas Company, D.T.E. 03-40 (2003). Specifically, please answer the following questions:

a) Are the time series data used no less than 30 years in length?
b) Has the Company used multiple variable regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
c) Are the appropriate tests and remedial procedures for multicollinearity, heteroskedasticity, and autocorrelation performed and presented? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
d) Has the Company tested and presented alternative functional forms (e.g., linear, logarithmic, parabolic, or other) of regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation.

Response: Marginal customer-related operating expenses are developed on Schedule JLH-3-6. Customer-related costs consist of two categories—plant-related expenses for operating and maintaining services meters and customer accounting and marketing expenses for billing, collection and marketing activities. Two separate econometric analyses were presented but not employed to quantify the customer-related costs. Schedule JLH-3-6, page 1 of 5, shows the plant-related costs, while the customer accounting and marketing expenses are shown on page 3 of 5. As discussed in my testimony, Bay State Gas Company's merger with NiSource resulted in a fundamental difference in the methods by which customer-related costs are incurred and booked by the Company. As a result, post-merger costs are inconsistent with prior Bay State practice. Some costs previously incurred by Bay State are now being performed by NiSource and, as a result, are being accounted for as expenses in Account 923, Outside Services. Refer to the response to DTE-2-8 for a further discussion of this subject. Based on discussions with Company personnel, the most significant changes in procedure were implemented

prior to 2003, making data for years 2003 and 2004 indicative of those expected in the future. As a result, the marginal cost study relies on the average costs for the last two years, adjusted for inflation, to estimate marginal costs on a forward-looking basis. Since my marginal cost study template includes provisions to automatically perform econometric analyses, the marginal cost study presents these studies. However, they do not form a valid basis for estimating marginal costs. In some instances, valid statistical trends were observed, despite the fact that the last two years were outliers. To rely on this historical data and ignore the most recent history, which is the best estimate of future costs, would be misleading and would not accurately measure the Company's marginal costs. Since the econometric analyses presented on pages 1 and 3 of Schedule JLH-3-6 were not applicable to the estimation of marginal costs, they incorporated some, but not all, of the Department's directives. Those directives that required additional iterations to evaluate alternative specifications were not fully developed.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-5 Refer to Exh. BSG/JLH-3. Please discuss whether the method of estimating the marginal distribution capacity cost complies with the Department's directives set in Fitchburg Gas and Electric Light Company DTE 02-24/25 and Boston Gas Company DTE 03-40. Specifically, please answer the following questions:

a) Are the time series data used no less than 30 years in length?
b) Has the Company used multiple variable regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation;
c) Are the appropriate tests and remedial procedures for multicollinearity, heteroskedasticity, and autocorrelation performed and presented? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
d) Has the Company tested and presented alternative functional forms (e.g., linear, logarithmic, parabolic, or other) of regression equations? If yes, please provide all workpapers, calculations, formulas, assumptions and supporting documentation.

Response: This response is predicated on the assumption that it is addressing total capacity-related distribution costs as developed on Schedule JLH-3-9. Since marginal distribution capacity costs are comprised primarily of carrying costs for distribution capacity-related investment discussed in response to DTE-2-1 and capacity-related distribution operating and maintenance expenses discussed in response to DTE-2-3, the response to this request has already been provided.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-6 Please state whether or not Mr. James L. Harrison was responsible for performing the Marginal Cost Study in the Fitchburg Gas and Electric Company, D.T.E. 02-24/25 (2002). If yes, please discuss in detail how the present Marginal Cast Study differs from the study filed in D.T.E. 02-24/25.

Response: Mr. Harrison was responsible for performing the marginal cost study in the Fitchburg Gas and Electric Company case, D.T.E. 02-24/25. There are three fundamental differences between the earlier Fitchburg study and the current one:

1) Updating – The current study reflects a new time period with revised Company-specific estimates of cost of capital and inflation escalation;
2) Econometric techniques – In response to the Department directives, the current marginal cost study expands the econometric analyses to include a longer time period and more rigorous statistical analyses; and
3) Company-specific analyses – Based on data availability and engineering input, many of the marginal cost analyses differ. The major differences are:
   a) Marginal production plant was estimated using the cost of an LNG facility for Bay State versus an LP-air facility for Fitchburg.
   b) Meter investment was developed for Bay State using an analysis of all existing meters including active, inactive and spare meters, while Fitchburg's analyses were based on typical metering costs for each class.
   c) Other gas supply, dispatching and regulatory expenses relating to transportation were quantified differently in accordance with the accounting systems employed by the two utilities. In Bay State's study, costs booked in Account 923, Outside Services, were assigned to the production and delivery functions, while Fitchburg's analysis required the segregation of Accounts 813, 851 and 928.
   d) The assignment of distribution-related operating and maintenance expenses between capacity and customer

components differed slightly between the two utilities due primarily to the accounting treatment of rental water heater and conversion burner programs.

e) Fitchburg's loss factor was computed as a 13-year historical average, while Bay State Gas Company's was based on an engineering estimate of forward-looking loss factors.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-7 Please estimate the marginal cost of all the expense categories (and update the marginal cost study) following the Department's directives set in Fitchburg Gas and Electric Light Company, D.T.E. 02-24/25 (2002) and Boston Gas Company, D.T.E. 03-40 (2003). In addition, please:

a) Define all the variables used in the marginal cost study and explain how the data corresponding to those variables were derived. If applicable, discuss what accounts and subaccounts (according to the Uniform System of Accounts for Gas Companies) were used to derive the time series data;
b) Provide on disk in Excel format all data and supported formula used in the estimation of the marginal cost study; and
c) For each expense category, present a graph showing the relationship between the dependent variable and time with the dependent variable on y-axis (vertical axis) and time on the x-axis (horizontal axis). Please provide an explanation of the trend.

Response: As explained in responses to DTE-2-1 through DTE-2-5, and as stated in my direct testimony, the Company believes that its marginal cost study follows the Department's directives in the Fitchburg and Boston Gas cases. These directives address econometric techniques to be applied to the analysis of historical data. In many instances, the marginal cost study revealed that older historical data is not representative of the costs to be expected in the future. In these instances, regression techniques do not provide meaningful estimates of marginal cost.

Only one econometric analysis was incorporated in the Company's estimates of marginal cost, capacity-related distribution expenses as shown on Schedule JLH-3-5. The remainder of this response addresses that analysis.

a) The dependent variable for capacity-related distribution expenses is derived on Schedule JLH-3-5, page 2 of 2. As shown on this schedule, distribution-related operations and maintenance expenses are categorized as capacity related, customer related, both or non-marginal. The notes on this page indicate how joint costs were

segregated between capacity- and customer-related cost categories. Those accounts containing capacity-related costs are as follows:

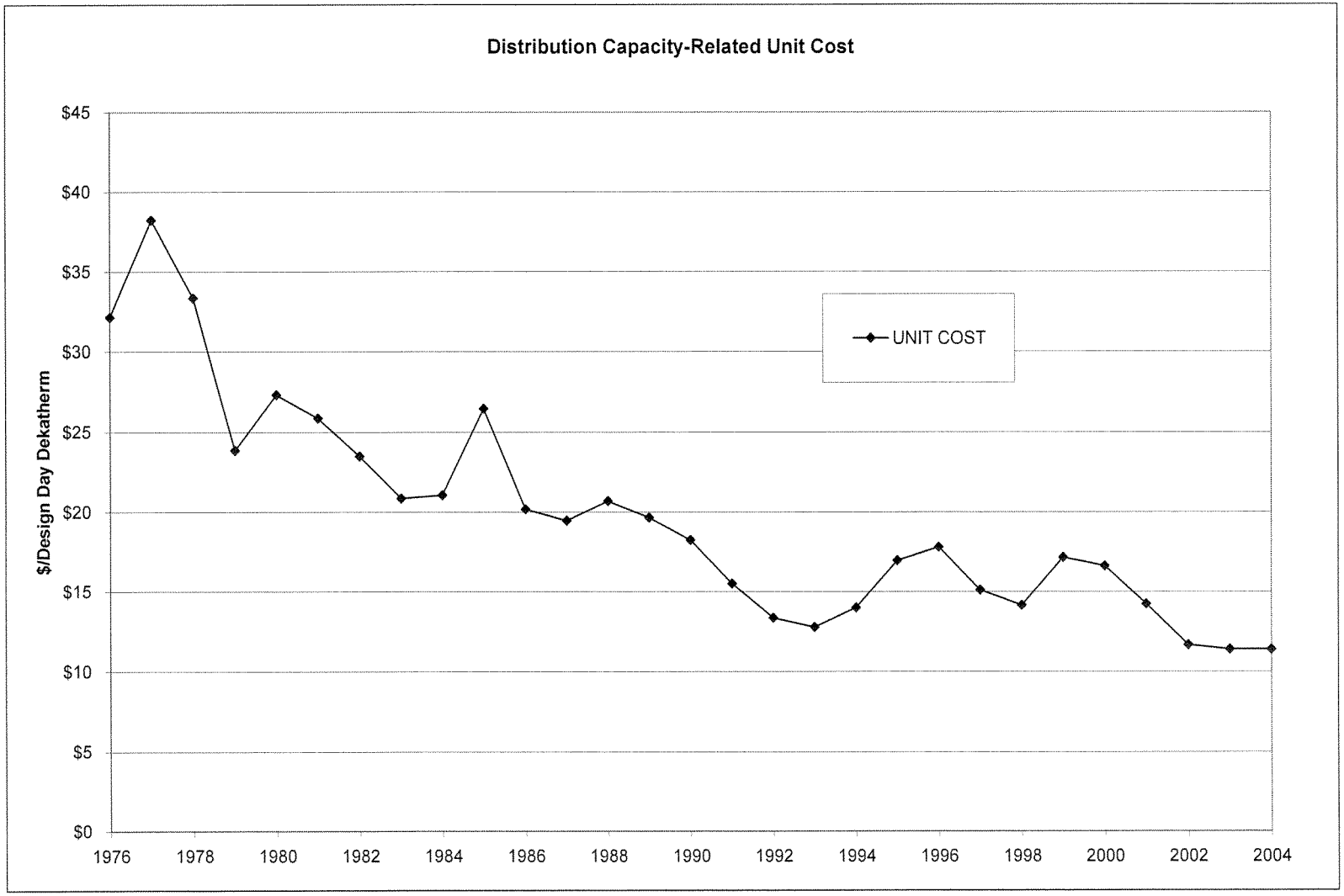
Account No.	Account Description
850	Supervision and Engineering
851	System Control and Load Dispatching
852	Communications Expense
853	Compressor Station Expense
857	Measuring and Regulating Station Equipment
874	Mains and Service Expense
880	Other Expenses
881	Rents
885	Maintenance Supervision and Engineering
886	Maintenance of Structures and Improvements
887	Maintenance of Mains
888	Maintenance of Compressor Station Equipment
889	Maintenance of Measuring and Regulator Station Equipment

The independent variable was forecasted design day demand for firm load. The independent variable was taken from the Company's periodic Forecast and Supply Plan Filings made to the Energy Facilities Siting Council. The independent variable is the sum of the forecasted demands for firm bundled sales service and firm transportation service.

b) The requested information is provided in a spreadsheet entitled, Cochran Orcott Adjustment.xls. This file contains all of the regressions examined in the course of the marginal cost study.

c) The requested graph is presented on DTE-2-7, Attachment 1.

DTE 2-7 Attachment 1



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE D.T.E.
D. T. E. 05-27

Date: June 6, 2005

Responsible: James L. Harrison, Consultant (Cost Studies)

DTE-2-8 Please refer to Exh. BSG/JLH-3, at 17-18. The Company states that since the merger, some of the customer accounting and marketing efforts formerly performed by Bay State personnel have been undertaken by NiSource personnel and billed back to Bay State as an Outside Service Expense in Account 923. In this regard, please:

a) Explain how those expenses, currently in Account 923, are captured in the Marginal Cost Study;
b) Discuss what econometric techniques the Company has tried to incorporate the effects of the merger on the customer accounting expenses. Please provide all workpapers, calculations, formulas, assumptions and supporting documentation; and
c) Discuss why the Company decided to use only the last two years worth of data, dismissing the information (the relationship between level of expenses and number of customers) carried from 1976 to 2002.

Response:

a) The marginal cost study uses a consistent method of estimating marginal costs for those categories that were impacted by the NiSource merger. For customer-related O&M expenses and for the loading factors used to reflect administrative and general expenses (including Account 923), marginal costs were estimated using the average of the last two years of historical data, adjusted for inflation because this period best represents the expectation of costs in the future. Using this approach, O&M expenses reflect the new and lower level of expected costs, and the loading factors used to recover administrative and general expenses are increased to reflect the higher level of outside services expected in the future.

b) The Company examined econometric techniques to estimate administrative and general expenses. The Company examined each combination of design day demand, customer count and sendout as explanatory variables for three categories of administrative and general expenses, non-plant related, plant related and total. A total of 21 regressions were evaluated as summarized on DTE-2-8, Attachment 1. The four most promising specifications were examined further. Pages 433 to 435 of JLH's Workpapers, which were initially

filed by the Company as part of Volume III, show the analysis of administrative and general expenses using total firm sendout and firm design day demand as independent variables. Pages 436 to 438 show a similar analysis using firm customer count and firm sendout as independent variables. Pages 439 to 441 show firm customer count and firm design day demand as the independent variables. Finally, pages 442 to 444 show design day demand as the lone independent variable to predict annual administrative and general expenses. These workpapers show the least square fits and adjusted specifications using the Cochrane Orcott method to reduce first order serial correlation.

The Company examined the detail available from NiSource's cost accounting system to determine if it were possible to identify customer accounting costs for Bay State Gas Company included in Account 923. However, the cost accounting system could not provide meaningful data to perform this analysis. As an example, customer accounting-related costs were aggregated with other computer-related costs, and a single allocation for IT services was assigned to Bay State. Due to the size of the database, the data is provided electronically on the attached compact disk – DTE-2-8 Attachment 1.

c) Marginal costs are forward looking, and they should represent the change in costs expected for a small change in output. In measuring marginal costs, historical costs are generally sunk and can only provide meaningful information if costs in the future can be reasonably predicted from cost patterns in the past. In some instances, cost causation will remain unchanged, making econometric analysis of historical data a valid method for estimating marginal costs in the future. However, when future costs are not well represented by historical patterns, econometric techniques have little value.

As an example, Schedule JLH-3-6 examines customer accounting and marketing expenses as a function of the number of firm customers. After adjusting for serial correlation, annual average cost per customer is estimated by the equation: $853 - $1.5888 x Year. The regression is reasonably strong with a 60% R-squared, a T Statistic of -6, and a Durbin Watson Statistic of 2.05. The prediction of $30.12 per customer for 2004 is statistically valid. However, due to the changes in procedure following the merger with NiSource, customer accounting costs dropped from the $12 million level to the current level of under $9 million per year. Much of this cost decrease was attributable to increases in outside services costs. Some of the customer accounting functions were provided by NiSource and billed to Bay State Gas Company as an outside service. Any prediction that utilizes primarily pre-merger data cannot reflect the change in operating procedures. In a few more years, we may have sufficient data to incorporate a dummy variable to reflect the merger in order to generate valid estimates; but for now, our best estimate of costs in the future must be based on the accounting methods that will be

employed in the future. Our best estimate is that the procedures employed for the last two years are representative of those in the future and, therefore, the costs for these two years can be used as a basis to estimate marginal costs.

Independent Variable	Customer	Total SO	Des Day Dmd	All	Desn Day & Customers Correl Coef = 97.4%	Total SO & Des Day Correl Coef = 94.5%	Customers & Total SO Correl Coef = 95.8%
NON-PLANT							
	Customers	Total SO	DD SO	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION
Slope	274.41	0.79	98.29	13.22 x1 - Slope	92.73 x1 - Slope	0.03 x1 - Slope	233.33 x1 - Slope
				0.01 x2 - Slope	16.33 x2 - Slope	95.33 x2 - Slope	0.13 x2 - Slope
				92.38 x3 - Slope	x3 - Slope	x3 - Slope	x3 - Slope
Y-Intercept	(43,392,753)	(20,512,503)	(15,406,325)	(16,978,500) Y-Intercept	-1.72E+07 Y-Intercept	-1.57E+07 Y-Intercept	-4.04E+07 Y-Intercept
R-Squared	83%	78%	87%	86.59% R-Squared	86.58% R-Squared	86.58% R-Squared	82.75% R-Squared
PLANT							
	Customers	Total SO	DD SO	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION
Slope	109.17	0.33	37.09	53.53 x1 - Slope	(1.87) x1 - Slope	0.30 x1 - Slope	33.04 x1 - Slope
				0.25 x2 - Slope	114.38 x2 - Slope	3.36 x2 - Slope	0.24 x2 - Slope
				(8.60) x3 - Slope	x3 - Slope	x3 - Slope	x3 - Slope
Y-Intercept	(18,680,208)	(10,359,199)	(6,818,927)	(15,361,754) Y-Intercept	-1.92E+07 Y-Intercept	-1.02E+07 Y-Intercept	-1.32E+07 Y-Intercept
R-Squared	61%	63%	57%	63.42% R-Squared	60.64% R-Squared	62.86% R-Squared	63.27% R-Squared
TOTAL							
	Customers	Total SO	DD SO	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION	MULTI-REGRESSION
Slope	383.58	1.12	135.38	66.75 x1 - Slope	90.86 x1 - Slope	0.33 x1 - Slope	266.37 x1 - Slope
				0.26 x2 - Slope	130.71 x2 - Slope	98.70 x2 - Slope	0.36 x2 - Slope
				83.78 x3 - Slope	x3 - Slope	x3 - Slope	x3 - Slope
Y-Intercept	(62,072,961)	(30,871,703)	(22,225,252)	(32,340,254) Y-Intercept	-3.64E+07 Y-Intercept	-2.59E+07 Y-Intercept	-5.36E+07 Y-Intercept
R-Squared	91%	88%	93%	93.61% R-Squared	93.24% R-Squared	93.50% R-Squared	91.83% R-Squared